Australian

Vol. 3

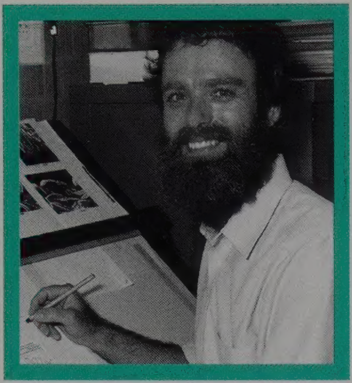
Ants

Their Biology and Identification

Monographs on Invertebrate Taxonomy

S.O. Shattuck

Drawings by N.J. Barnett



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AUSTRALIAN **ANTS**

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Printed in Australia

For Bede Lowery, S.J. and Ian Prosser, M.D.,

who made it possible.

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Abstract

This book is an introduction to the fascinating world of Australian ants. It is designed especially for non-specialists and uses minimal technical language and includes extensive illustrations. Detailed information is presented on all 103 ant genera known to occur in Australia.

Introductory sections provide information on the general biology of ants. This includes distribution patterns within Australia, an overview of life cycles and nesting habits, and notes on feeding habits and pest status. Information is also provided on classification, collecting and preparing specimens, the use of identification keys and terms used when identifying ants.

Keys to the 103 genera known to occur in Australia are included. The usability of these keys is greatly increased by having all characters illustrated and line drawings placed immediately below each couplet. The few technical terms used in the keys are illustrated and explained in a detailed glossary.

Extensive notes are included for each genus. These include details on separating each genus from other genera which are superficially similar; information on distribution, feeding habits, habitat preferences and general biology; and an introduction to the more important research papers relevant to the genus. In addition, the section on each genus includes scanning electron micrographs of typical workers as well as a distribution map showing known collection sites. Finally, a list of all described species found in each genus is included.

Acknowledgements

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The scanning electron micrographs were prepared by Mark Dominic of the CSIRO Entomology/Plant Industry Microscopy Centre. The line drawings and introductory figures were prepared by Natalie Barnett of CSIRO Entomology.

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This work is dedicated to Fr Bede Lowery, S.J. and Dr Ian Prosser. Fr Lowery's extensive knowledge of the Australian ant fauna has resulted in collections and field notes second to none and has advanced our understanding in ways yet to be fully appreciated. His passing in November 1996 was a deep loss and will be felt for a long time to come. Dr Ian Prosser, of the Woden Valley Hospital Oncology Department, provided support, understanding and advice during my struggle with lymphoma. Without their help this project would not have been possible.

Introduction

No one can live in Australia without having personal contact with ants. They are found everywhere, from the centre of the largest cities to the most remote outback locations, from coastal mangroves to the highest peaks of the Australian Alps. And they are hardly shy. They happily live in gardens and city parks and will even live indoors in potted plants or crevices in walls. Nests can be huge with tens of thousands of workers and extensive mounds, or small with only a handful of workers clustered together in small cavities between rocks or inside twigs. At the same time, some ants are among the rarest invertebrates in Australia. Numerous species have been encountered fewer than ten times, and several have been found only once and are known from only one or two specimens.

One of the most noticeable things about Australian ants is the large number of species and individuals found at most locations, especially in the arid zone. Ants are well adapted to life in Australia, with up to 150 species occurring in many of the national parks and nature reserves throughout the country. This great abundance, combined with their predatory, scavenging and seed feeding behaviour, makes them one of the most important groups of terrestrial animals in Australia. This is especially true for the arid zone. Here ants are especially prominent as they forage, often in large numbers, at all times of the day and night. They are constantly on the search for food and will quickly attack and monopolise any resource. They are also very protective of their nests and foraging areas, displacing other insects, and sometimes other animals, from areas which they use frequently.

About this Manual

This manual provides an overview of these fascinating insects, including information on all 103 genera known to occur on mainland Australia, Tasmania and nearby islands. Illustrated keys, featuring a minimum of technical language, are provided to assist with the identification of workers, the most commonly encountered caste. For each genus, the manual includes a description of the characters used to identify the genus and to separate it from similar genera, illustrations prepared with a scanning electron microscope to show overall appearance ('habitus'), an overview of the biology of the genus, a list of described species, a summary of the more important publications dealing with the genus, and a map showing locations where the genus has been found. In addition, a glossary explains terms used in the keys and generic discussions.

The terminology used has been kept as simple as possible. However, in many cases technical terms supplement the simpler text. While the language has been simplified, the characters used are the same as those found in most major taxonomic works on ants. Thus this manual provides an introduction to the terms and morphological characters found in traditional taxonomic papers. It is hoped that this manual will make the traditional taxonomic works more understandable and accessible.

Ants in Australia

The ant fauna of Australia is especially large and diverse. World wide, there are 16 subfamilies, about 300 genera and about 15,000 described species and subspecies of ants. Australia is currently known to have representatives of 10 subfamilies, 103 genera and 1275 described species and subspecies. While the numbers of Australian subfamilies and genera are unlikely to increase significantly, the number of species may well double as species-level studies are completed. Thus Australia currently has representatives of two-thirds of the world's ant subfamilies, one-third of its genera and, as far as we know, about 15% of its species. A few of the genera found in Australia occur nowhere else, and many are shared with only our closest neighbours. Most of the species, however, are limited to Australia, with only a minority occurring in both Australia and neighbouring regions.

Australia compares well with other regions of the world in terms of numbers of genera and species, and in the number of groups which are unique to the region. Australia has fewer

genera than Central and South America and South-east Asia (i.e. Malaysia to New Guinea), about the same number as the Orient (i.e. Pakistan to Vietnam), and more than North America, Europe and northern Asia and Africa. Central and South America and Africa have the largest number of genera limited to a single region, South-east Asia and Australia have about the same number of restricted genera, and Europe and northern Asia, North America and the Orient have the fewest unique genera. When comparing species, Australia has fewer than Central and South America, Africa or South-east Asia, about the same number as Europe or northern Asia, and more than North America or the Orient. For additional details, see Bolton (1995a).

Distribution Patterns within Australia

Australia is a large and diverse continent with habitats ranging from dry sandy deserts to lush tropical rainforests (Fig. 1). These different habitats form distinct patterns across the Australian landscape, patterns which have a strong impact on the distribution of ants. For example, many species are found only in rainforests in the warm, high rainfall areas along the northern and eastern coasts (Fig. 2). In fact, about 23 of the 103 Australian genera are limited to coastal Queensland and north-eastern New South Wales (see Fig. 3 for these and other locations) and are not found anywhere else in Australia. If we add to these rainforest habitats the higher rainfall forests and Mediterranean climate regions of southern New South Wales, Victoria, Tasmania, southern South Australia and south-western Western Australia, the number of genera limited to these regions grows to about 50, or nearly half of all known Australian genera. Additionally, more ant genera have been found at certain Queensland rainforest sites than at any other Australian site of comparable size, with up to 76 genera being recorded. In contrast to this, the dry arid zone of central Australia is occupied by only about 25 genera. None of these genera is limited to the arid zone, as all occur in higher rainfall areas nearer the coasts. It is also worth noting that no genera are limited to Western Australia or Tasmania.

Fig. 1.
Distribution of major habitat types in Australia. These types are used when discussing the habitat preferences of individual genera.

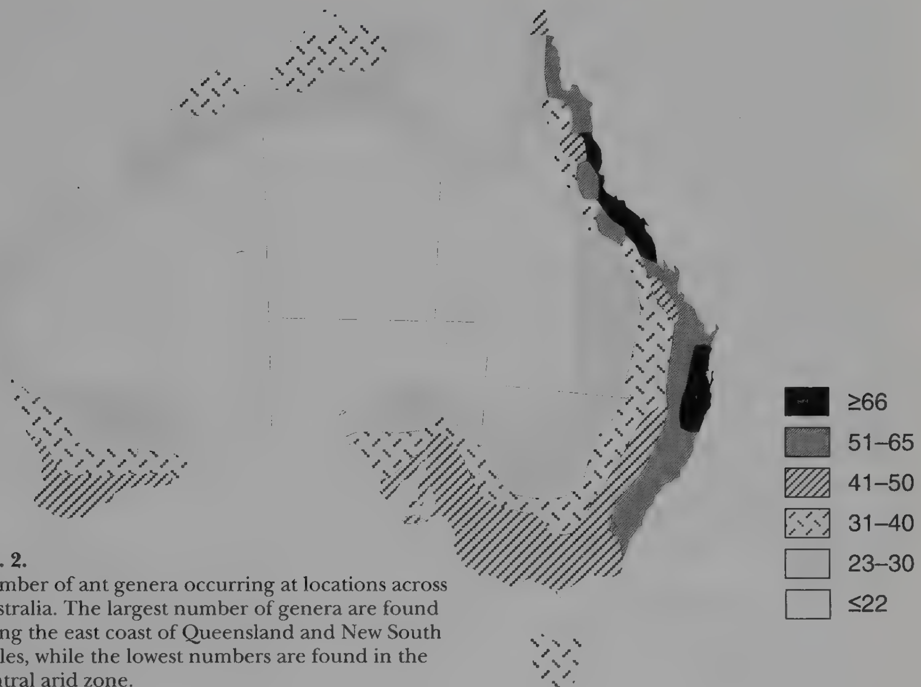


Fig. 2.
Number of ant genera occurring at locations across Australia. The largest number of genera are found along the east coast of Queensland and New South Wales, while the lowest numbers are found in the central arid zone.

Fig. 3.
Map of Australian states and major cities. These places are used when discussing the distribution of individual genera.

This general pattern seen in ant genera is similar to the pattern seen in many other groups of animals: the greatest richness is found in moist, forested areas nearer the coast and only a limited subset extends into the inland arid areas. This pattern is so strong that the ant fauna of extreme south-western Australia (e.g. in the vicinity of Perth) is more similar to that of the moist south-east than it is to that of the much closer northern Western Australia (e.g. the Kimberley region).

At the species level, the pattern is considerably different to that seen for genera. With the exception of alpine and highly disturbed areas, many regions of Australia have similar numbers of species, commonly between 80 and 100 belonging to 15–50 genera. This is because rainforest genera tend to contain only a small number of species while many of the arid zone genera are exceptionally large and include many species. Thus it would seem that while relatively few genera have been able to invade the Australian arid zone, they nonetheless have been very successful, with as many species occurring in these areas as in forested areas, including tropical rainforests. Locations with the largest numbers of species are likely to be in one of two regions: either in the semi-arid transition zones where the faunas of the moist south-eastern forests mix with those of the arid areas, or in the northern arid zone where the northern tropical fauna mixes with that of the more southern arid zone. It is possible that up to several hundred species may be found at locations in these regions. It is surprising that in most regions of the world the highest species richness occurs in rainforest areas, while in Australia the richest areas are much more arid.

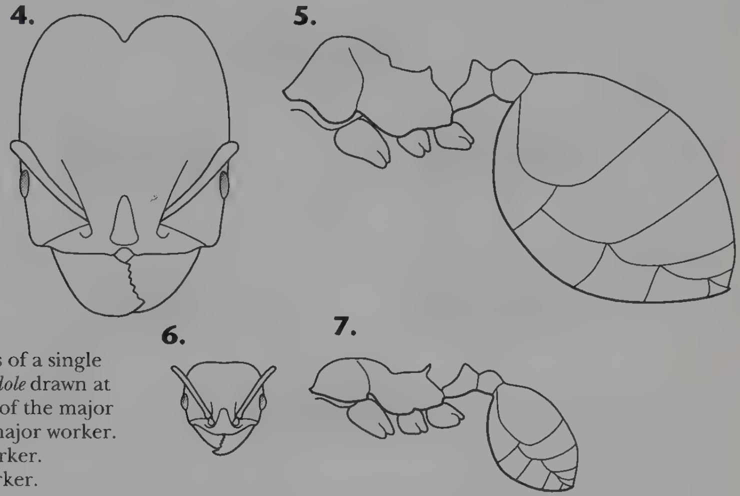
Life in an Ant Colony

Ants are social insects which form small to large colonies. A typical colony contains an egg-laying queen and many adult workers together with their brood (eggs, larvae and pupae). Workers are by far the most numerous individuals in the nest. They are responsible for nest construction and maintenance, foraging, tending the brood and queen, and nest defence. While all workers are female, they are sterile and do not lay eggs. Winged queens and males are present in the nest for only a short period. Soon after emerging they leave the nest to mate and establish new nests. Queens are generally similar to the workers, differing primarily in having larger bodies. In some species, fully winged queens are lacking and egg-laying is undertaken either by typical workers or by individuals which are morphologically intermediate between typical queens and workers (these are called ergatoid queens). Males are generally about the same size as the workers or smaller, and have smaller heads with large ocelli, very short scapes and small mandibles. In many cases males look more like wasps than ants.

Workers in a single nest can all be the same size or they can very greatly in size. When all are of the same or a similar size they are said to be monomorphic. In some cases the variation in size can be so extreme that large workers (Figs 4, 5) are twice the size of small workers (Figs 6, 7). If variation between small and large workers is continuous, the workers are said to be polymorphic. If there are only two distinct size classes of workers, they are called dimorphic. Many of the polymorphic and dimorphic species show allometry. That is, the heads and mandibles of the large, or major, workers are disproportionally large when compared to those of the small, or minor, workers.

The workers are the most commonly seen caste, especially as they forage on the surface of the ground or when they are disturbed under rocks or other objects on the ground. However, in most species not all workers forage outside of the nest. Ants show a strong division of labour, where different workers perform different tasks within the nests, and in some cases the specific tasks undertaken will depend on the age of the ant. For example, it is common for young, newly emerged workers to remain in the nest and tend eggs, larvae and pupae. As the workers age, they may shift their activities away from tending brood and begin to undertake nest construction and excavation. Finally, later in life they may become foragers, leaving the nest to search for food. In contrast to this, some workers may perform the same activities throughout their lives, or in other cases, all workers may undertake all activities of the colony,

performing any given activity for a few days before switching to another. In many dimorphic and polymorphic species, the size of the worker will influence its activities. For example, major workers may only be found in or near their nests while only minor workers are found foraging away from the nest. This cooperation and division of labour, combined with their well-developed communication systems, has allowed ants to utilise their environment in ways approached by few other animals.



Figs 4–7.
Major and minor workers of a single species in the genus *Pheidole* drawn at the same scale. 4. Head of the major worker. 5. Body of the major worker. 6. Head of the minor worker. 7. Body of the minor worker.

The Life Cycle

The typical ant nest begins with a single individual, the queen (Fig. 8). This queen flew from her home nest a day or two earlier, together with other queens and males from her nest and other nests in the area. The queen searches for a mate, often being attracted to large, distinctive objects such as especially tall trees, large shrubs or hill tops. These sites act as meeting places for queens and males from many nests, ensuring that they can find each other. The queen then mates with one or a few males, initially while still in the air but shortly thereafter falling to the ground. Once mated, she searches for a suitable nest site. Where she searches will vary with the species and can range from the tops of trees to open soil. Either during her search or once a suitable site is found she bites off her wings as they are no longer needed. She then seals herself into a small chamber or other secluded place and lays a small batch of eggs. The queen remains in the nest with her brood while it develops, feeding the growing larvae special trophic (unfertilised) eggs which she lays specifically as food for them. These first workers are often much smaller than subsequent workers as the queen can only provide a limited amount of food compared with that which foraging workers can provide. Once these initial workers mature, they leave the nest and begin to forage, returning captured prey to the queen and her additional brood. The colony grows as more workers mature, these new workers taking over the care of brood as well as bringing in additional food. At this stage, the queen reduces her activities to egg laying and the workers assume all other tasks in the nest. The queen is still essential for normal colony life, however, as the chemical messages she produces controls the activities of all workers in the nest.

The above pattern of nest founding is one of the most common and widespread; however, many species vary from it. For example, mating may take place on or in existing nests. It is also common for several queens to establish a nest together and then either live together or later

fight among themselves to determine which queen remains in the nest, the others being forced out or killed. In other species, new colonies are established when a new queen leaves an existing nest together with a number of workers and relocates to a new location some distance away. Queens may forage outside the nest before the first workers emerge. They may remain in their parental nests or form small satellite nests which share workers with the main nest. In others, brood may be removed from the main nest and placed in small groups together with a few workers near food sources. The specific details of nest founding is as varied as the ants themselves. For a more comprehensive discussion, see Hölldobler and Wilson (1990).

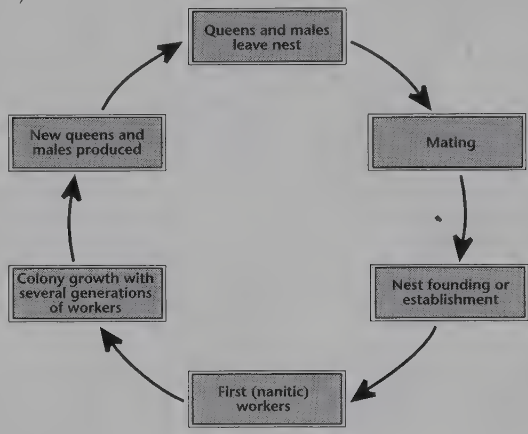


Fig. 8.
Overview of the life cycle of a typical ant colony.

As the colony reaches maturity, it begins to produce the queens and males which will form the next generation. Numerous factors determine when new queens are produced, including the time of year, the food available to the growing larvae, the size and contents of the egg laid, pheromones or hormones produced by the queen and the age of the queen. The production of males has a much simpler controlling mechanism. As it turns out, females (queens and workers) are diploid. That is, they have two copies of each chromosome. Males, on the other hand, are haploid and have only a single copy of each chromosome. Because of this, fertilised eggs, where an egg and sperm combine, form females, while unfertilised eggs develop into males. These factors combine to give the colony a high degree of control over when queens and males are produced, as well as the relative numbers of each.

The larvae of these new queens and males are similar to the larvae of workers but are generally larger. Once they emerge, they remain in the nest waiting for environmental triggers to initiate their leaving the nest. These same triggers will cause the simultaneous release of queens and males from the vast majority of nests of a given species in the area. Because of this, huge numbers of queens and males can be released on the same day over hundreds of kilometres. In open country with scattered shrubs, huge numbers of flying ants can be seen hovering over each shrub over large distances. These mass emergences last only a few days, with the queens mating and attempting to establish new nests while the males generally die within a few days of leaving their nests.

Once established, individual nests can last many years. Queens are known to live as long as 23 years in captivity (Haskins and Haskins 1992) although they are likely to be more short-lived in nature. In some species, established colonies will produce or accept new queens if the existing queen dies. Other species add additional queens as the colony grows. In these species, nests can potentially last indefinitely as new queens replace older queens, thus ensuring the constant production of new workers. Individual workers generally live a few years but detailed studies are few. Males can remain in nests for some months and in some species they will over winter. However, most will die within a few days of leaving their nests.

Nests

Ants are one of the few groups of animals which modify their immediate environment to suit their needs. They build often elaborate nests in a range of situations, sometimes expending huge amounts of energy in their construction. These nests are commonly occupied for years and some for decades. In addition, some ants will use plant fibres or soil to construct protective coverings over feeding areas. Only a handful of animals manufacture such elaborate and complex structures.

Nests in soil vary from small, simple chambers under rocks, logs or other objects on the ground to extensive excavations extending several metres into the soil. The exact structure of the nest varies with the species, soil type and situation. When viewed from the surface, the entrances to these subterranean nests show a wide range of styles. Many are no more than a cryptic hole just large enough for a single worker to squeeze through. Others are a single entrance surrounded by soil which varies from low and broad mounds to tall, narrow turrets. A number of species assemble soil and leaves around their nest entrances to form large piles with well-defined, vertical sides and concave tops. Others collect plant material to construct thatched mounds above their subterranean nests. The nests of the common meat ants (*Iridomyrmex*) of south-eastern Australia can grow to enormous sizes with tens of thousands of workers. They clear all vegetation from the surfaces of their nests and cover them with small stones. A single colony can be composed of numerous individual nests separated by up to several hundred metres. The individual nests can have ten or more separate, small entrances just large enough for individual workers to move through.

Some species of ants nest arboreally. Their nests are most frequently found in twigs, branches or the trunks of trees. Australian species are not known to attack firm wood, most utilising the burrows of other insects such as beetle larvae, or entering rotten wood or wound sites caused by wind or insect damage. In most cases the entrances to these types of nests are either small and circular or formed by the natural contours of the tree or branch. In a few arboreal species nests are constructed using leaves. For example, the green tree ant (*Oecophylla*) glues together individual leaves with silk produced by their larvae. The colony expands both by enlarging existing leaf nests and by adding new satellite nests. In other arboreal species, plant fibres are used to construct coverings which are attached to the leaf surface. The ants live within the chamber formed by the covering and the leaf.

While many ants form elaborate nests, those of other species are relatively simple. Many of the species found in rotten wood do little more than remove loose wood fibres to construct simple chambers for workers and brood. These chambers can be small or very extensive but often lack the complexities of nests found in the soil or arboreally. Finally, a handful of species lack what would normally be thought of as a nest and are found in small groups clustered on the ground in leaf litter or among the roots of plants. These species move their 'nests' frequently and can be found in a wide range of suitable sites.

Feeding

The majority of ants are general predators or scavengers, feeding on a wide range of prey including other arthropods and seeds. Adult ants feed exclusively on liquid foods. They collect these liquids from their prey or while tending Hemiptera and other insects. Solid prey, that which is most often seen being carried by workers, is generally intended as food for larvae. Adults which remain in the nest, including the queen, receive much or all of their food directly from returning foragers in a process called trophallaxis. During foraging, workers collect fluids which are stored in the upper part of their digestive system. Upon returning to the nest, these workers regurgitate a portion of this stored fluid and pass it on to other workers. In some extreme species, this fluid is transferred to special workers, called repletes or honey ants, which remain permanently in the nest and act as living storage vessels. They store food when available and distribute it to the colony in times of shortage.

While most ants will feed on a wide variety of foods, others specialise on a much narrower range. A number of species show a strong preference for Collembola. Others prefer the eggs of assorted arthropods. Still others raid the nests of other ants to capture their larvae and pupae. Many of the groups with specialised feeding requirements also possess unusual morphological adaptations. For example, the mandibles in some of the highly predacious groups are much elongated and are armed with large teeth, especially at their tips.

The seeds of many plants have special food bodies (called elaiosomes) which are attractive to ants. Ants collect these seeds, eat the food body and sometimes the seed as well. Many of the seeds remain intact after the food body is removed. These seeds are often placed within the ants' nest or on their midden piles where they later germinate. It is believed that seeds collected by ants have a higher chance of germinating and surviving when compared with seeds which are not collected. This is because they are less likely to be attacked by seed predators and because they are often placed in sheltered locations near the ants' nutrient-rich refuse piles.

In general, ants show a preference for foraging either during the day or at night. In some groups foraging will occur both during the day and at night, although there may be peaks of activity with fewer foragers active during some periods. In the arid zone, the foraging activity of many species is highly dependent on temperature. Some species are only active during the cool morning and evening hours, while others are active only during the hottest parts of the day. On cool or heavily overcast days, species which are normally only seen at night may be active during the day while high-temperature loving species may remain in their nests all day.

Ants as Pests

Ants cause problems primarily when they forage in buildings for food or water and when they construct nests in buildings and gardens. When searching for food, they can be attracted to a wide range of products with different species preferring sweets, meats, fats or oils. They will also search indoors for water during dry periods. When desirable items are found many species will recruit fellow nest mates to help gather the food and return it to the nest. This can result in large numbers of ants appearing over a short period of time.

Ants can be a nuisance when attempts are made to establish plants through direct seeding. They will forage for the newly planted seeds, removing them to their nests and causing reduced germination.

Some ants build nests in walls and foundations, or indoors in potted plants, enclosed areas, and even in cavities in toilets and sinks. In almost all cases nests are limited to pre-existing cavities or spaces between objects or in rotten wood and seldom will ants attack solid structures when selecting nest sites. Thus they generally will not cause structural damage to buildings but will take advantage of existing deterioration. Outdoors, nesting activity can result in excavated soil being deposited in gardens and on brickwork. In most cases this causes little property damage but some species, especially species of *Aphaenogaster*, can form large numbers of chambers close to the surface. These chambers can cause soil to become soft and uneven, causing serious problems when found in golf courses or some types of pastures or crops. A few species will occasionally attack electrical wiring, apparently being attracted to either the insulation or the magnetic fields produced by the wires. In these situations extensive damage can occur.

Ants often move nest sites when disturbed, or with a change in food supply. This can make control and removal of ants difficult. They may leave for short periods only to return later when a new food source is located and they can recolonise from nearby nests very quickly.

Several species of ants pose serious health threats to people who are sensitive to their stings. These include species of *Myrmecia* in southern regions and *Odontomachus* in northern areas. In extreme cases hospitalisation may be required. Other species are known to carry diseases and can pose a serious threat in hospitals and veterinary clinics. Fortunately these cases are uncommon in Australia and in general ants are mainly a nuisance pest rather than a health problem.

Ants and Environmental Monitoring

Ants are especially common in Australia. They occur in large numbers in all habitats throughout Australia. Ant communities change significantly when environmental conditions are altered. As a consequence, the monitoring of ant communities has become an important component of environmental inventories. A wide range of government and non-government agencies and private companies use the monitoring of ant communities to assist them in making decisions about managing the environment.

It is well known that bush fires can cause significant damage to the environment, but properly managed fire can actually improve conditions for many plants and animals. To determine optimal fire regimes and thus protect the environment, extensive studies have been completed to determine the effects of different burning practices. Ants have proven very useful in determining the effects of fire and thus in developing management strategies which optimise its impact. For additional information, see Andersen (1991b, 1993) and Majer (1990).

The monitoring of ant communities has proven to be a useful tool when determining management strategies or while evaluating the recovery of areas after severe disturbance. For example, inventories of the ants present in a mine site before disturbance have proven to be very useful in establishing the baseline conditions for successful restoration. Ants also play an important role in monitoring ecosystems and in determining priorities with regard to conservation and sustainable use.

Classification

Classification is a system of names used to group plants and animals which are closely related. This helps to organise our knowledge of the great diversity of living things. The system used in biology is composed of a hierarchical or nested set of categories, starting with the broad, general groupings and progressing through a series of categories to the smallest group, a single species (Fig. 9). The highest group is the Kingdom and all animals belong to the same kingdom, the Animalia. Below kingdom is Phylum, followed by Class, then Order, Family, Genus and finally Species. For example the common meat ant would have the following classification.

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Formicidae
Subfamily: Dolichoderinae
Genus: *Iridomyrmex*
Species: *purpureus*

Fig. 9.
The classification of the common meat ant (*Iridomyrmex purpureus*) found in south-east Australia.

In addition to these major categories, several additional categories are used which lie between them. The more important of these include Subfamily, Tribe, Subgenus and Subspecies. All ants belong to a single family, the Formicidae. Within the ants, only three categories are commonly used, the subfamily, genus and species. The subfamily is the largest grouping, and determining which subfamily a specimen belongs to is the first step in any identification. There are 16 living subfamilies world-wide, with ten of these occurring in Australia. Of these ten subfamilies, five (Dolichoderinae, Formicinae, Myrmeciinae, Myrmicinae and Ponerinae) are very common and are encountered regularly in most areas of Australia. The remaining subfamilies vary from fairly common in areas were they occur to very rare and seldom seen. Most ants can be placed in a subfamily with little difficulty, and with practice the subfamily key can be bypassed so that identification of most specimens will begin with the generic keys.

The category below subfamily is genus. There are about 300 genera of ants world-wide and 103 of these are found in Australia. The genus is the fundamental identification unit in ants and most ants can be identified to genus with minimal difficulty (especially when compared with species-level identifications). Additionally, much of the current information about Australian ants is of a general nature and is applicable to most members of a genus. Thus identifying ants to genus level is a manageable task which will provide considerable information on the biology and ecology of the specimen. The names of genera are always printed in italics or are underlined when handwritten.

The final level of classification is the species. To reliably identify a specimen to species level, either a recent, detailed taxonomic revision is necessary, or reliably determined material must be available for comparison. In many cases species can be determined only by sending specimens to one of the larger collections so direct comparisons can be made with previously determined material. However, even in these cases the identification of many species will be very difficult or impossible because most groups of Australian ants have yet to be studied in detail.

As with generic names, the names of species are always printed in italics or are underlined when handwritten. In addition, the name of the person originally describing the species is also included. For example, the name of the common meat ant of south-eastern Australia is *Iridomyrmex purpureus* (Smith), where *Iridomyrmex* is the genus name, *purpureus* is the species name (or, technically, the species epithet) and Smith is the author of this name. In this particular case Smith's name is placed in parentheses to indicate that his species is no longer in the same genus that he originally described it in. This is because Smith had placed his species in the genus *Formica* (as *Formica purpurea* Smith) and it was subsequently moved to the genus *Iridomyrmex*.

Identification

While ants are one of the most familiar insects and can be reliably identified by even the youngest naturalist, what exactly is it that makes an ant an ant? There are several traits which will separate them from other insects. First, all ants have either a single small, distinct segment, the petiole, or two small segments, the petiole and postpetiole, between the mesosoma and gaster. For definitions of these morphological terms see the next section as well as the Glossary. These separate segments are absent from almost all other insects other than a few groups of wasps. A character that is found only in ants is the metapleural gland. This gland is found on the side of the propodeum just above the hind leg and has a small opening to the outside of the body. It should be noted that while this gland is found only in ants, not all ants have a metapleural gland. A few genera in the subfamily Formicinae have lost the metapleural gland and its associated opening.

In addition to these two characters, there are several other distinctive traits of ants. One is their elbowed antennae. The first segment of the antenna, the scape, is much longer than the remaining segments, the funiculus, and the joint between them is highly flexible. During normal activity the scape is held upright and near the head with the funiculus projecting forward in front of the body. This arrangement allows the tips of the antennae to be positioned near the mouthparts to assist in inspecting nearby objects, or to be extended forward away from the body to investigate more distant objects. While a sting is present in many ants, it is absent in several large and common groups and is of little use in separating ants from many other insects.

The keys used here are dichotomous. That is, they are composed of paired, contrasting descriptions. Together, the two descriptions (or lugs) comprise a couplet. A specimen is compared with each of the descriptions in a couplet and the most appropriate description or lug is selected. At the end of each description is either a number or a name (Fig. 10). The number indicates the couplet to proceed to next to continue the identification, while a name indicates that the identification is complete and the specimen belongs to (or is likely to belong to) that group.

40. Eyes small, with at most four facets (ommatidia) in greatest diameter, and round or nearly round (Fig. 269a) .... *Anisopheidole*
Eyes large, with eight or more facets (ommatidia) in greatest diameter, and distinctly oval or elongate (Fig. 270aa) 41

Fig. 10.
A typical couplet found in an identification key.

Once a name is found, it is wise to check additional information to confirm that the name seems reasonable and appropriate for the specimen. This additional information can include overall similarity of the specimen to other members in the suspected group, the description listing detailed unique or diagnostic characters, the habitats used by the group and the known distribution of the group. If any of these seem inappropriate, the identification should be treated cautiously until it can be confirmed by comparison with reliably determined material or by a taxonomist experienced with the group.

In some cases none of the characters listed in either lug of a couplet will seem appropriate or the characters in a lug only partially match the specimen. In these cases it is likely that a mistake was made earlier in the key and that the specimen was not intended to run to this part of the key. When this happens the previously used couplets should be rechecked to determine if an incorrect lug was selected. One trick used by experienced key users is to note any 'problem' or ambiguous couplets during an identification. Later, if the key becomes difficult to use because the characters seem inappropriate, the other lug of the 'problem' couplet is tried. If a mistake was indeed made, the other path through the key will often run much more smoothly and the characters used will better fit the specimen.

The keys in this volume are designed to identify workers only. This is because workers are by far the most commonly encountered caste of ants and the best known taxonomically. Because queens and, especially, males are much less common it is often very difficult to identify them, even in cases where the workers are common and well known. A key to the subfamilies of ants is presented first, followed by keys to the genera of each subfamily.

The characters used in the keys are limited to those found on the outside of the body. In addition every effort has been made to select easily observable and unambiguous characters. However, the small size of ants means that reliable identification is only possible with the use of a microscope. The maximum magnification necessary will vary with the specimen being examined, but a range of 10× to 50× will generally be required. In a few cases higher magnification would be desirable although not essential.

Selecting proper microscope illumination is important. For example, a low-quality light source will degrade the image seen through even an expensive microscope. Additionally, some types of illumination will cause bright reflections to appear on the surface of the insect, which will obscure the pattern of the surface sculpturing. Because of this, it is important to consider a range of light sources when choosing a microscope and illuminator.

Terms Used in the Keys and Descriptions

Major Parts of the Body

The ant's body is divided into four main sections. The head is the first section, followed by the large mesosoma, the small petiole and sometimes the postpetiole, and finally the gaster. The

head carries the antennae and mouthparts, the three pairs of legs are attached to the lower surface of the mesosoma and the gaster terminates with a defensive structure (often a sting or acidopore). Although the mesosoma and gaster appear to correspond to the thorax and abdomen of most other insects, this is not the case. The rear section of the mesosoma, the propodeum, is actually the first abdominal segment, the petiole is the second segment and the postpetiole, when present, is the third segment. The gaster is composed of the remaining segments of the abdomen.

Head

The most important taxonomic structures on the head are the antennae, palps and clypeus (Fig. 11). The *antennae* are composed of two major parts, the long first segment, the *scape*, which is attached to the head, and the remaining shorter segments, collectively called the *funiculus*. The important characteristics of the antennae include the number of segments (when counting the number of segments, the scape is always included), the length of the scape (usually in relation to the length of the head), and, in some groups, the position of antennae when at rest against the front of the head.

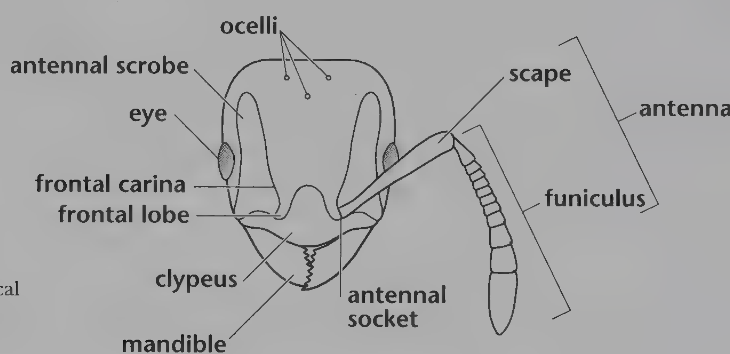


Fig. 11.
The front of a typical ant head with the major structures labelled.

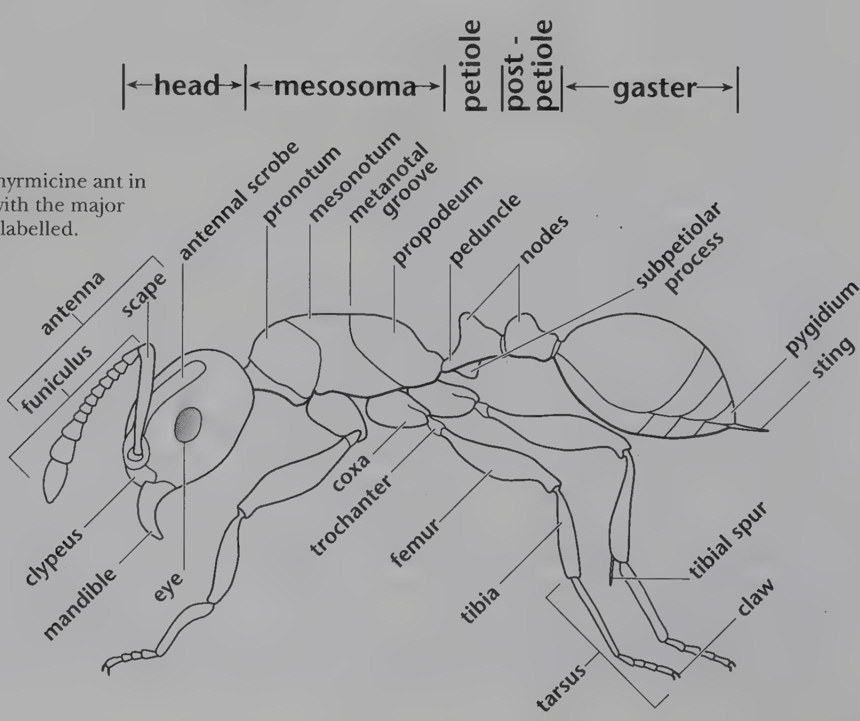


Fig. 12.
A typical myrmicine ant in side view with the major structures labelled.

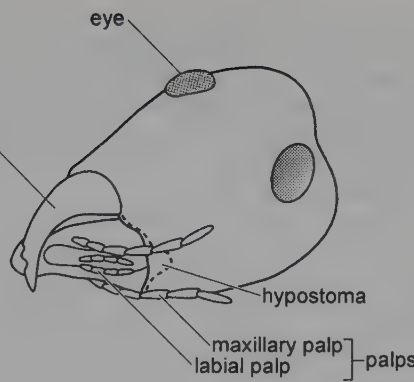


Fig. 13. The underside of the head of a typical ant with the major structures labelled.

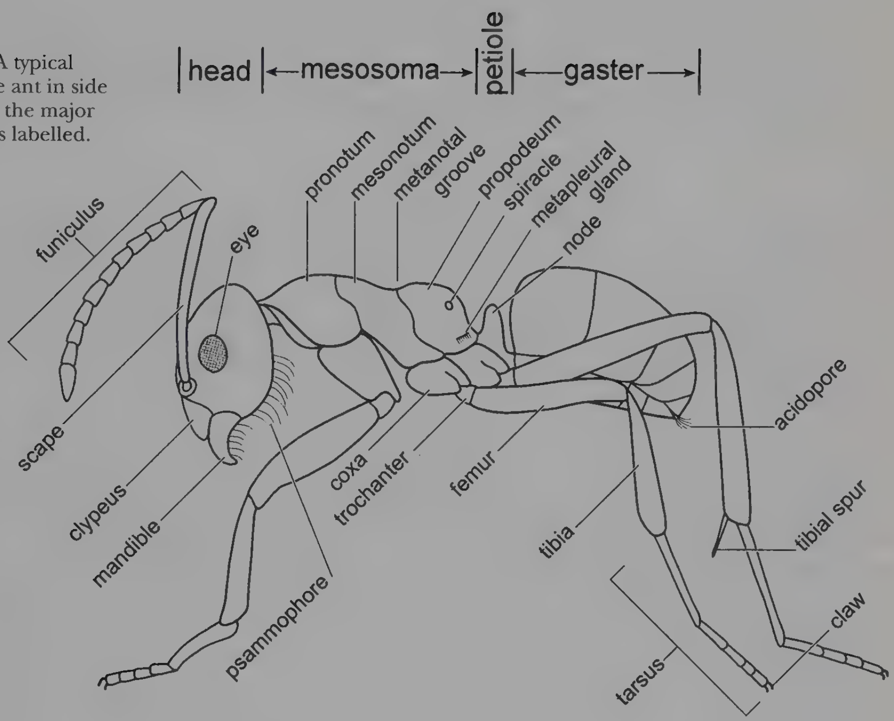


Fig. 14. A typical formicine ant in side view with the major structures labelled.

The *palps* are small, segmented, sensory organs found on the mouthparts and are visible on the underside of the head behind the mandibles (Fig. 13). There are two pairs, the outer pair situated on the maxillae (called the maxillary palps) and the inner pair situated on the labium (called the labial palps). The number of maxillary palp segments varies from six to one (with six being the most common) and the number of labial palp segments varies from four to none (four being the most common). The *palp formula* is the standard method used to indicate the number of palp segments and is composed of the number of maxillary palp segments followed by the number of labial palp segments. For example, a palp formula of 6:4 would indicate that the maxillary palps have six segments while the labial palps have four segments.

The *clypeus* is the plate on the lower section of the front of the head above the mandibles and below the antennae. Its lower edge (above the mandibles, here called the front margin) is usually convex in overall shape, but can be highly modified with concave regions, teeth or variously shaped projections. The rear section (near the antennae) is usually narrowed, convex or triangular and often extends between the forward sections of the frontal lobes. The central region of the clypeus is usually smooth and gently convex across its entire width, although in some groups it may have a pair of weak to well-developed diverging ridges (in which case the clypeus is described as being longitudinally bicarinate).

In some groups the shape of the *frontal carinae* is important. The frontal carinae are a pair of ridges on the front of the head; these ridges start just above the clypeus and between the antennal sockets and extend upwards. Their development varies from being very short, weakly developed or even absent to very distinct and running the length of the head. The lower section of the frontal carina is often expanded towards the side of the head and partially or completely covers the antennal socket. In these cases this section of the frontal carina is called the *frontal lobe.*

Other important features on the head include the compound *eyes* (which vary in size, shape and position, and can be absent), the position of the *antennal sockets* (the points where the antennae attach to the head), the development of a *psammophore* (a collection of long hairs on the underside of the head), the presence of *antennal scrobes* (elongate depressions or grooves on the front of the head which receive the scapes when at rest), and the shape of the *mandibles* including the number and placement of teeth.

Mesosoma

The *mesosoma,* also called the alitrunk, is the middle section of the body to which the legs are attached (Figs 12, 14). It is behind the head and in front of the petiole. In workers the mesosoma is relatively simple, with a limited number of sutures and plates. Queens, however, have a much larger mesosoma with many sutures and plates. This additional complexity is required because queens typically have wings during the early part of their lives. The larger mesosoma houses the flight muscles and the additional sutures and plates are used to control the wings during flight.

The mesosoma has numerous structures of taxonomic importance. The upper surface (tergite) of the first segment, immediately above the front legs, is called the *pronotum.* In most ants the pronotum forms a separate, distinct plate but in some it is fused with the sclerite behind it, the mesonotum, to form a single plate. The *mesonotum* is the upper surface of the mesosoma behind the pronotum and in front of the metanotal groove. It is essentially the central one-third of the mesosoma and has the middle pair of legs attached to its underside. The *metanotal groove* is an angle or depression on the upper surface of the mesosoma which separates the mesonotum and the propodeum. In some groups the metanotal groove is lacking and the upper surface of the mesosoma is uniformly arched when viewed from the side. The *propodeum* is the rear section of the mesosoma, above the hind legs and immediately before the petiole. The *metapleural gland,* or more correctly, its opening, is located on the side of the propodeum immediately above the hind leg and below the propodeal spiracle, near the attachment point of the petiole. Its small opening is often surrounded by tiny ridges or is located in a shallow, elongate depression. The opening is often protected by a fringe of elongate hairs or setae. In a few groups the metapleural gland is absent and the area above the hind leg is smooth.

Legs

The legs are composed of five main segments. The segment nearest the body is the *coxa,* followed by the very short *trochanter* (which is seldom used in ant taxonomy), the long *femur* and *tibia,* and finally the *tarsus.* The tarsus is composed of five small segments with a pair of small, curved *claws* at its tip. The claws are most commonly a single, curved shaft terminating

in a sharp point. However, in some groups the claws can have from one to many small teeth along their inner margins. The junction of the tibia and the tarsus is usually armed with a large, stout, articulated, spike-like structure called the *tibial spur*. The number of spurs can be none, one or two, and they can be simple or comb-like (*pectinate*). These structures are best viewed from the front with the leg extending outwards from the body at right angles to its long axis.

Petiole and Postpetiole

The *petiole* is the first segment behind the mesosoma and is present in all ants. Behind the petiole is either the *postpetiole* or the *gaster*. The postpetiole is found in only some subfamilies of ants. When present, it forms a distinct segment separate from the gaster. The upper surfaces of the petiole and postpetiole are often high and rounded or angular. This upright structure is called the *node*. In some cases the node is absent and the petiole is low and tube-like. The narrow forward section of the petiole in front of the node is called the *peduncle*. This section can be long, short or absent. In many groups there is a subpetiolar process, a projection or lobe on the underside of the petiole near its attachment to the propodeum. This process varies from being absent to thin and pointed to broad and rounded.

The petiole and postpetiole provide a flexible junction between the mesosoma and gaster. This allows an ant to bring the tip of the gaster forward towards the front of its body. In this position the sting or the opening for the defensive system can be used to subdue prey or attack intruders.

Gaster

The last segment of the body is the *gaster*. In most ants it is smooth in outline, but in some the first segment is separated from the remainder by a shallow constriction, and in a very few each segment is separated by shallow constrictions. A *sting* is often visible at the tip of the gaster, although it is retractable and may not be visible even when present. In some ants the sting is absent and the tip of the gaster terminates in a small, slit-like or circular, glandular opening. Finally, the upper plate (tergite) of the last segment of the gaster is called the *pygidium*.

General Terms

There are a number of terms used for general structures found on ants. A *seta* is an elongate hair ranging from upright and standing above the body's surface to appressed against the surface. A *spiracle* is a small opening in the body which is part of the respiratory system. The most obvious spiracles are generally those near or in the metanotal groove and on the sides of the propodeum. The shape and location of the propodeal spiracle can be of significant taxonomic importance. A *suture* is a line or impression formed where two body plates or sclerites meet.

Collecting Methods

Collecting can be as simple as picking up stray ants and placing them in a glass jar or as complicated as completing an exhaustive survey of all species present in an area and estimating their relative abundances. The methods used will depend on the final purpose of the collections. For taxonomic studies, a long series from a single nest which contains all castes (workers, including majors and minors, if present, queens and males) is desirable to allow the determination of variation within species. For ecological studies, the most important factor is collecting identifiable samples of as many of the different species present as possible. Unfortunately, these methods are not always completely compatible, with the taxonomist sometimes overlooking species in favour of those groups currently under study, while the ecologist often collects only a limited number of specimens of each species, thus reducing their value for taxonomic investigations.

To collect as wide a range of species as possible, several methods must be used. These include hand-collecting, using baits as attractants, ground litter sampling, and the use of pitfall traps. For a general overview of collecting methods, see Upton (1991).

Hand-collecting consists of searching for ants everywhere they are likely to occur. This includes on the ground, under rocks, logs or other objects on the ground, in rotten wood on the ground or on trees, in vegetation, on tree trunks and under bark. When possible, collections should be made from nests or foraging columns and at least 20–25 individuals should be collected. This will assure that all individuals are of the same species and will increase their value in detailed studies. Since some species are largely nocturnal collecting should be done at night as well as during the day. Specimens are collected using an aspirator (often called a pooter) (Fig. 15), forceps or a fine, moistened paint brush, or with fingers if the ants are known not to sting. Individuals are placed in plastic or glass tubes (1.5–3.0 ml capacity for small ants, 5–8 ml for larger ants) containing 75–95% ethanol. Plastic tubes with secure tops are better than glass because they are lighter and do not break as easily if mishandled.

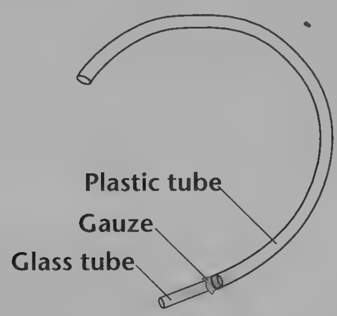


Fig. 15.
An aspirator or 'pooter' used for collecting smaller ants.

Baits can be used to attract and concentrate foragers. This often increases the number of individuals collected and will sometimes attract species that would be difficult to locate otherwise. Sugars and protein will attract different species and both should be utilised. Honey is a good sugar source while tuna or cat food are readily available and inexpensive protein sources. These baits can be placed either on the ground or on the trunks of trees or large shrubs. When placed on the ground baits should be situated on small paper cards or other flat, light-coloured surfaces, or in test tubes or vials. This makes it easier to spot ants and to capture them before they can escape into the surrounding leaf litter.

Many ants are small and forage primarily in the layer of leaves and other debris on the ground. Hand collecting these species can be difficult. One of the most successful ways to locate these small, cryptic foragers is to collect the leaf litter in which they are foraging and extract the ants from it. This is most commonly done by placing leaf litter on a screen above a large funnel, often with a heat source above the leaf litter (a Berlese funnel). As the leaf litter dries from above, ants (and other animals) move downwards and eventually fall out the bottom and are collected in alcohol placed below the funnel. This method works especially well in rain forests and wet sclerophyll areas. A method to improve the catch when using a funnel is to sift the leaf litter through a coarse screen before placing it above the funnel. This will concentrate the litter and remove larger leaves and twigs. It will also allow more litter to be sampled when using a limited number of funnels.

The pitfall trap is another commonly used tool for collecting ants. A pitfall trap can be any small container placed in the ground with the top level with the surrounding surface and filled with a preservative. Ants are collected when they fall into the trap while foraging. The diameter of the traps can vary from about 18 mm to 10 cm and the number used can vary from a few to several hundred. The size of the traps used is influenced largely by personal preference while the number will be determined by the study being undertaken. The preservative used is usually ethylene glycol or propylene glycol, as alcohol will evaporate

quickly and the traps will dry out. If specimens will not be needed for long-term storage, automobile anti-freeze can be used successfully, although the dyes used may discolour some specimens. One advantage of pitfall traps is that they can be used for collecting over a period of time with minimal maintenance and effort. One disadvantage is that some species are not collected as they either avoid the traps or do not commonly encounter them while foraging. For further discussion on the use of pitfall traps, especially in ecological studies, see Greenslade (1973), Andersen (1991a) and Abensperg-Traun and Steven (1995).

When possible, members of a single nest or foraging column should be kept together. This will assist later when determining the amount of variation within a species and helps associate workers with queens and males (when present). Similarly, pitfall or bulk-collected material should be labelled so that extra care can be taken to determine if several similar species are present or if there is only a single, variable species. One commonly used method to associate members of a single collection is to assign it a sequential number. Using this system is helpful because it reduces the time needed to label individual tubes in the field, can be used to cross reference field notes with specimens, provides information on which individuals are from the same nest or foraging column, and can be used to associate specimens stored on pins and in alcohol (see below).

Specimen Preparation

For short-term storage, ants can be placed in 75–95% ethanol (= ethyl alcohol). They should be kept cool and in darkness and should not be allowed to dry out. After initial collecting, the alcohol should be changed to assure that the concentration is appropriate (it can be diluted by body fluids when first collected). Also, any dirt, plant material or other debris that was collected with the ants should be removed. This material can stain the ants if left with them for extended periods. It is especially important that the tubes be stored in the dark as light will cause colours to fade and the cuticle or integument will deteriorate over time, greatly reducing the usefulness of the material for taxonomic studies and making identifications difficult or impossible.

For detailed study and long-term storage, ants should be point-mounted on insect pins. Pointing allows specimens to be easily manipulated while being examined with a microscope and is essential for viewing fine details such as sculpturing and pilosity. In all cases, ants, even large species such as those in the genus *Myrmecia*, should be placed on points and not directly pinned (Figs 16, 17). This is because the mesosoma is relatively thin and in many species there is a flexible suture between the pronotum and mesonotum. If a pin is placed through the mesosoma the pronotum will often break away from the mesonotum, seriously damaging the specimen.

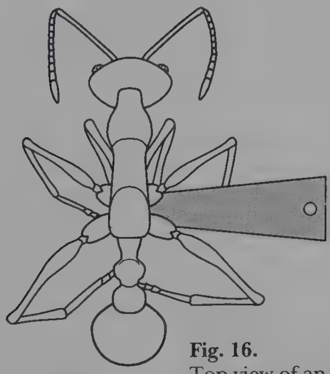


Fig. 16.
Top view of an ant mounted on a triangular point.

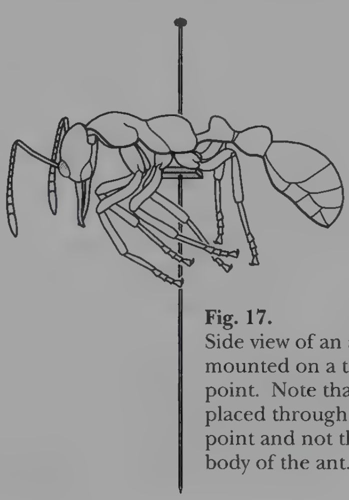


Fig. 17.
Side view of an ant mounted on a triangular point. Note that the pin is placed through the paper point and not through the body of the ant.

A commonly used procedure for curating ants is as follows. Field-collected specimens are transferred from the original collecting vial to a small dish and covered with alcohol. Several specimens are selected for mounting, with the exact number depending on several factors. For example, if the species is represented by only a single caste (no major or minor workers, or queens or males present) then about six workers should be sufficient. If, however, the species is polymorphic or queens or males are present, then representatives of all castes should be selected. Another factor influencing the number of specimens is their size. It is desirable to place two or three workers on separate points but on the same pin. This saves space in collections, allows several specimens to be examined at the same time under the microscope, and associates polymorphic workers with each other and queens and males with workers. Because of this it is common to mount ants in sets of three. For example, three workers on each of two pins, or a queen, male and worker on a single pin, or a major, medium and minor worker on a single pin. Large species should mounted similarly, but in sets of two on three pins. The remainder of the series can be stored in alcohol for future use.

Individual points can be either hand-cut from strips of stiff, white, high-quality, acid-free paper, or punched with a specially designed hand-punch. The use of a punch is preferable if large numbers of ants are to be mounted as it produces points quickly and of uniform size and shape. The glue used to attach ants to the points should be water-soluble to allow for later removal if needed. Stainless steel insect pins of size 2 or 3 can be used to hold the points.

Individual ants should be glued to the tip of the point with just enough glue to hold them securely but not so much that the lateral or upper surfaces are obscured. It is best to place the point so that it contacts the basal segment (coxa) of the mid and hind legs. Specimens should be mounted upright, horizontal and with the point extending from the ant's right side. Another important procedure is to very gently position the legs so that they do not obscure the body when viewed from the side. This is one of the more difficult aspects of mounting ants but is also one of the most important as identifications will be difficult if the specimen can not be viewed clearly. Finally, the number and configuration of mandibular teeth are important characters in many groups. If possible, at least one of the mounted specimens should have the mandibles open so the inner margin is visible. A careful inspection of the available specimens will often reveal individuals that are in better positions for mounting. These individuals should be selected as they will help in reaching a better final result.

There are two common methods of placing ants on points. The first is to place the point on the pin and then glue the ant to the upper surface of the point. The other method is to lay the ant on its back and then glue the point (without a pin) to the underside of the ant. Once the glue has dried, the point plus ant can then be turned upright and placed on a pin. The first method works satisfactorily for small ants but generally not for larger specimens. When placed on top of a point, larger specimens tend to tilt or even fall off before the glue can dry. Because of this, the second method is preferable, especially for large specimens, and is often used for small ants as well. With this method, the tip of the point can rest on the ant while its base rests on the table or microscope until the glue dries. This minimises tilting of the specimen and results in a higher quality preparation.

In summary, the most important things to remember when pointing ants are: (1) always use points and never directly pin ants; (2) use only enough water-soluble glue to hold the ant on the point without using so much that it covers the sides or upper parts of the specimen; (3) place the ant at the very tip of the point with the point covering the first segment of the middle and hind legs nearest the body; (4) keep the ant upright so that it is positioned on top of the point with the long axis of the body horizontal and at right angles with the point, the upper surface of the body upwards and the length of the point towards the right side of the ant; and (5) try to (very) gently pull the legs downwards so that the outer surface of the body can be seen in side view and open the mandibles so that the inner margins are visible.

A few things to avoid include: (1) direct pinning through the body; (2) burying the ant in glue; (3) placing several ants on a single, large card; (4) placing the specimen on its side, or upside down; and (4) having the legs up over the sides of the body.

Once the specimens are properly mounted, the final step is to add labels. Labels are the standard type used in entomology, and include as a minimum the location (state and nearest named place), date and collector's name (Fig. 18). Additional information which should be included if available include the latitude, longitude and elevation of the collection site, a brief description of the habitat, and the collection number (if used). The use of collection numbers alone should be avoided as this information is useless if the collection notes are not available. This last point is especially important if material is to be deposited in another collection or museum, or is to be sent to a specialist for identification. The value of the specimens will be greatly increased if biological information is included on the labels. Often, especially in the future, these short notes may be the only information available regarding these specimens and will provide the only clues as to their biology.

NSW. 10 km SW Mt Kosciusko 36°31'S 148°11'E 25.xi.1990 S.O.Shattuck & N.J.Barnett

Dry sclerophyll, edge of swamp Ex. dead branch on tree

NSW. 10 km SW Dubbo 32°19'S 148°32'E 25.xi.1990 S.O.Shattuck & N.J.Barnett

Woodland. Ex. Hollow log

Fig. 18.
Two sets of typical labels. These labels are placed below the ant on the same pin used to hold the triangular point to which the ant is glued.

Additional Reading

The information presented in this book is intended as an introduction to the large and diverse world of ants. In addition, there is an extensive literature concerning all aspects of ant biology, ecology and taxonomy published by numerous researchers in a wide range of books and scientific journals. The more important of these are listed in the discussions of individual genera. There is also a series of publications which examine ants on a world-wide basis. One of the most significant is *The ants*, by Bert Hölldobler and Edward Wilson (1990). This large tome is a very complete and up-to-date summary of our knowledge of ants and is essential reading for anyone interested in these animals. For those wanting to identify ants or learn about their taxonomy and classification, two books by Barry Bolton, *Identification guide to the ant genera of the world* (Bolton 1994) and *A new general catalogue of the ants of the world* (Bolton 1995b), are highly recommended. For a listing of about 8000 publications dealing with the systematics of ants, *A bibliography of ant systematics*, by Philip Ward, Barry Bolton, Steve Shattuck and William Brown (1996), is an invaluable resource.

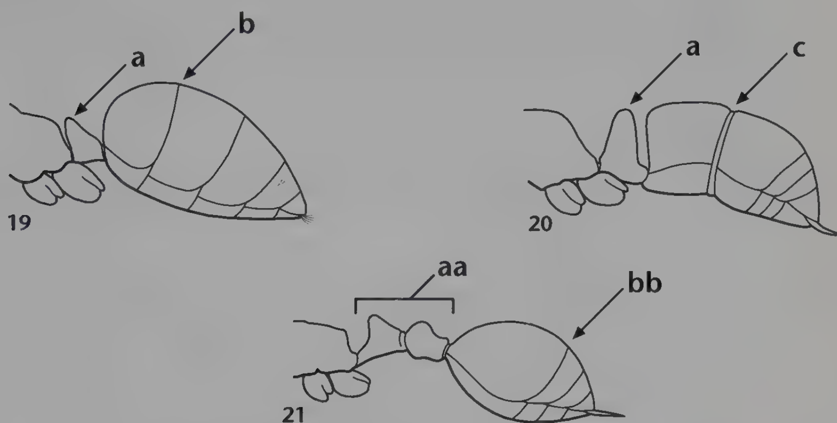
For the Australian fauna, Robert Taylor has published a checklist of species (Taylor and Brown 1985) as well as two papers which concern a range of species in the subfamilies Formicinae and Myrmicinae. These are *Nomenclature and distribution of some Australasian ants of the Myrmicinae (Hymenoptera: Formicidae)* (Taylor 1991b) and *Nomenclature and distribution of some Australian and New Guinean ants of the subfamily Formicinae (Hymenoptera: Formicidae)* (Taylor

1992). Dr Taylor has also presented an overview of the entire Australian fauna in his contribution to *The Insects of Australia* (Naumann 1991). As well as these taxon-based studies, John Greenslade (1979) has published *A guide to ants of South Australia* and Alan Andersen (1991c) has prepared *The ants of southern Australia, a guide to the Bassian fauna.* These guides provide detailed information on the ants occurring in these regions. Taken together, the above mentioned publications provide extensive information on the ant fauna of Australia as well as summarising the extensive published literature concerning these interesting insects.

Key to the Subfamilies

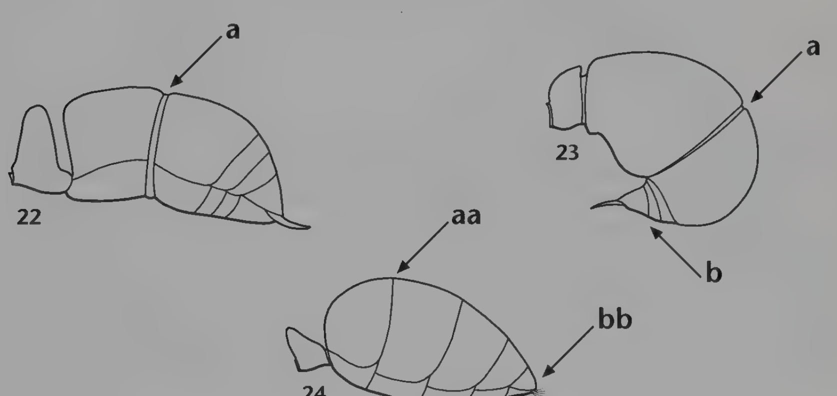
1. Mesosoma attached to the gaster by a single, distinct segment (the petiole) (Figs 19a, 20a). Junction between the first and second segments of the gaster either smooth and uniform (Fig. 19b) or slightly impressed (Fig. 20c) 2

   Mesosoma attached to the gaster by two segments (the petiole and postpetiole), each segment being set off by distinct constrictions (Fig. 21aa). Gaster always smooth and uniform in shape and without an impression between the first and second segments (Fig. 21bb) 7



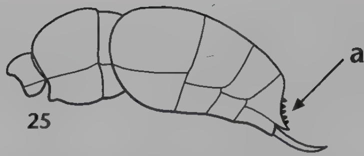
2. Gaster with a slight but distinct impression between the first and second segments (Figs 22a, 23a) or, in some cases (species of *Discothyrea*) the gaster is highly modified and the impression is weak or essentially absent, but these have the tip of the gaster directed downwards and located along the lower surface of the body (Fig. 23b) 3

   Gaster uniform in outline, without an impression between the first and second segments (Fig. 24aa) and with the tip of the gaster always directed rearwards (Fig. 24bb) 4



3. Upper surface of the tip of the gaster (the pygidium) flattened and with a row of small spines or peg-like teeth along its outer and trailing edge (Fig. 25a) . . . .**Cerapachyinae**

   Upper surface of the tip of the gaster (the pygidium) rounded and without a row of spines or teeth on its outer and trailing edge (Fig. 26aa) . . . .**Ponerinae** (in part)



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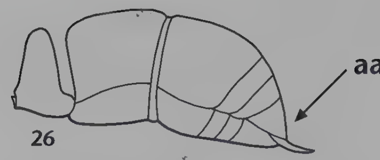

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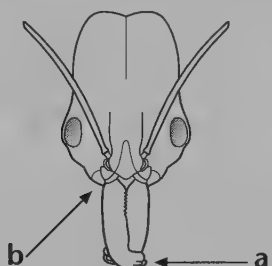
4. Mandibles elongate and straight, with large teeth only at the extreme tip (Fig. 27a), and attached close together along the front margin of the head (Fig. 27b) .... **Ponerinae** (in part)

Mandibles triangular, with distinct teeth along the entire inner margin (Fig. 28aa), and with their attachments at the outer corners of the front margin of the head (Fig. 28bb) 5



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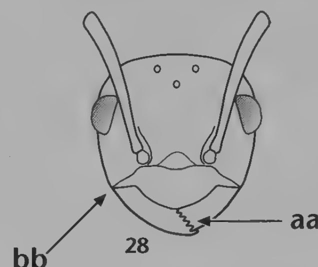

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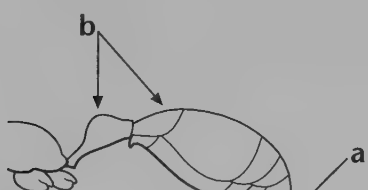
5. Sting present and usually visible at the tip of the gaster (Fig. 29a). Petiole about the same length as the first segment of the gaster, or slightly longer (Fig. 29b) .... **Nothomyrmeciinae (with the single genus *Nothomyrmecia*)**

Sting absent (Fig. 30aa). Petiole almost always much shorter than the first segment of the gaster (Fig. 30bb) 6



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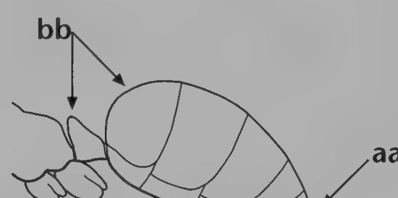

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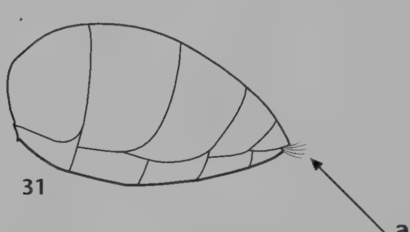
6. Tip of the gaster with a circular or semicircular opening (acidopore) which is often fringed with short hairs (Figs 31a, 32a) .... **Formicinae**

Tip of the gaster slit-like and never with a fringe of short hairs (Figs 33aa, 34aa) .... **Dolichoderinae**



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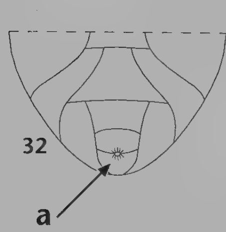

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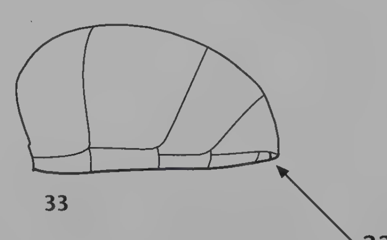

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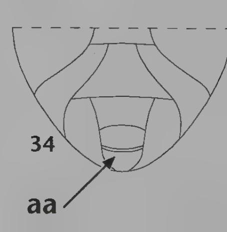

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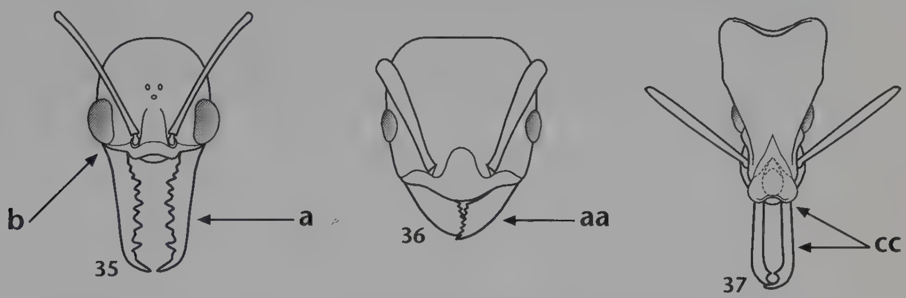
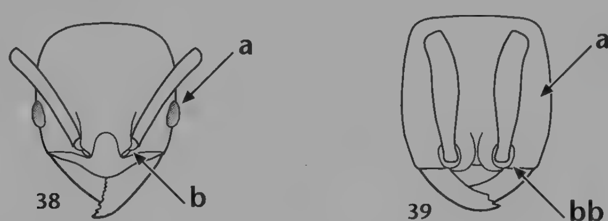
7. Mandibles very long, more or less straight, with teeth along their entire inner margin (Fig. 35a), and attached near the outer corners of the front margin of the head (Fig. 35b). Larger species, usually over 8 mm in total length . . . . **Myrmeciinae (with the single genus *Myrmecia*)**

Mandibles generally triangular (Fig. 36aa), but if elongate then there are no teeth along the inner margin and they are attached near the middle of the front margin of the head (Fig. 37cc). Smaller species, generally under 8 mm in total length 8



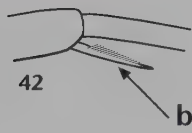
8. Eyes almost always present, conspicuous and with many facets (ommatidia) (Fig. 38a) but absent in a few species. Frontal lobes present and expanded towards the sides so that they cover the inner part of the antennal bases where they are inserted into the head when viewed from the front (Fig. 38b) 9

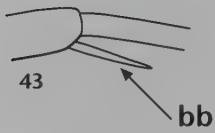
Eyes absent (Fig. 39aa) or at most with only one facet (ommatidium). Frontal lobes absent so that the bases of the antennae are completely visible where they are inserted into the head when viewed from the front (Fig. 39bb) 10

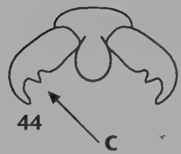


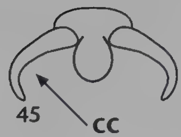
9. First segment of the mesosoma (pronotum) connected to the second segment (mesonotum) by a flexible joint (Fig. 40a). Tibiae of the hind legs with large comb-like (pectinate) spurs (Fig. 42b). Tarsal claws toothed (Fig. 44c). Eyes very large and elongate (Fig. 40d). Body elongate and slender . . . . **Pseudomyrmecinae (with the single genus *Tetraponera*)**

First segment of the mesosoma (pronotum) fused to the second segment (mesonotum) (Fig. 41aa). Tibiae of the hind legs either with simple spurs (without comb-like teeth) (Fig. 43bb) or lacking spurs. Tarsal claws simple (Fig. 45cc). Eyes generally small and round (Fig. 41dd). Body often short and compact . . . . **Myrmicinae**









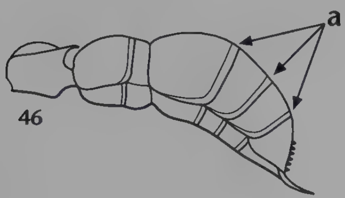
10. Antennae with ten segments (including the scape). Overall body length over 3 mm . . . . **Aenictinae (with the single genus *Aenictus*)**

Antennae with 12 segments (including the scape). Overall body length less than 2.5 mm . . . . **Leptanillinae (with the single genus *Leptanilla*)**

Key to the Genera of the Subfamily Cerapachyinae

1. Gaster with the junctions between the last four segments smooth so that in profile their upper surfaces form a smooth outline (Fig. 46a)... *Cerapachys*

   Gaster with the junctions between the last four segments distinct constrictions so that in profile their upper surfaces form a series of convexities (Fig. 47aa)......... *Sphinctomyrmex*



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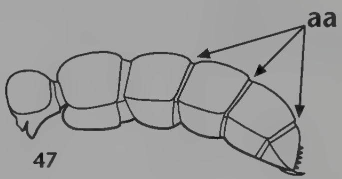

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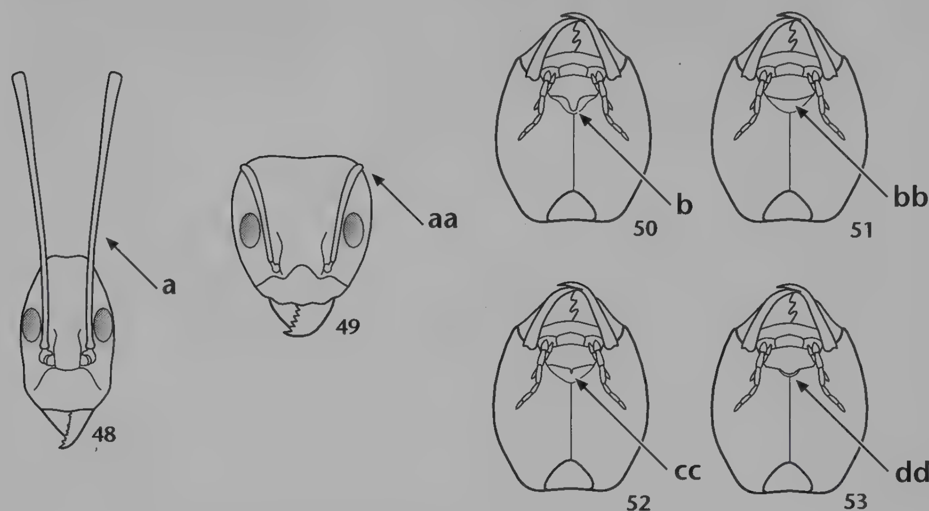
Key to the Genera of the Subfamily Dolichoderinae

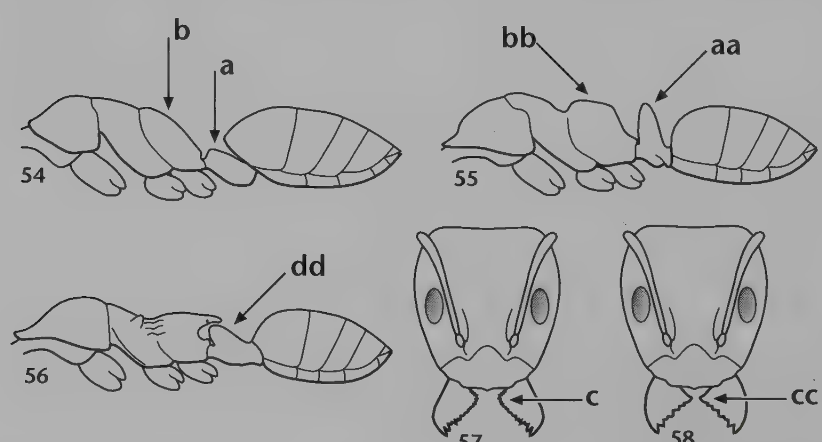
1. Scapes surpassing the rear margin of the head by one-half their length or more (Fig. 48a). Front of the underside of the head (medial hypostoma) notched in the centre (Fig. 50b) .... *Leptomyrmex*

   Scapes surpassing the rear margin of the head by less than one-half their length and sometimes not at all (Fig. 49aa). Front of the underside of the head (medial hypostoma) usually entire (Fig. 51bb) but sometimes grooved (Fig. 52cc) or completely absent (Fig. 53dd) 2



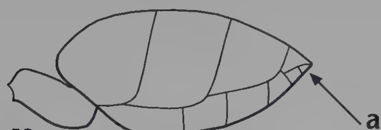
2. Node of the petiole greatly reduced or absent, the forward face absent or at most indistinct (Fig. 54a). Upper face of the propodeum (when well defined) shorter than the rear face (Fig. 54b). Mandibles lacking a distinct angle between the surface containing the teeth and the surface near the clypeus (basal angle is absent) (Fig. 57c) 3

   Node of the petiole present and with distinct forward and rearward faces (Fig. 55aa) (although sometimes strongly inclined forward and with a short forward face (Fig. 56dd)). Upper face of the propodeum generally the same length or longer than the rear face (Fig. 55bb), but occasionally shorter. Mandibles with a distinct angle between the surface containing the teeth and the surface near the clypeus (Fig. 58cc) 4



3. Gaster with four plates on its upper surface (fifth gastral tergite ventral) (Fig. 59a). Pronotum generally lacking erect hairs .... *Tapinoma*

Gaster with five plates on its upper surface (fifth gastral tergite dorsal) (Fig. 60aa), although the last segment is sometimes small and retracted. Pronotum commonly with 2–10 erect hairs .... *Technomyrmex*



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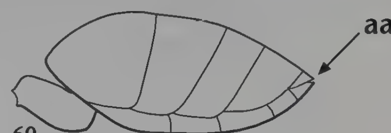

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4. Spiracle on the propodeum located near the upper face and rearwards near the angle (Figs 61a, 62a) 5

Spiracle on the propodeum located well below the upper face along the rear face and below the angle (Fig. 63aa) 6

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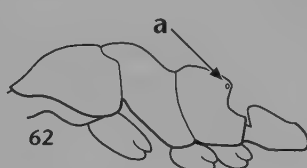

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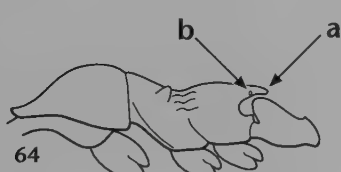
5. Propodeum with distinct, blunt spines which are directed rearwards (Fig. 64a) and with the spiracle located at the base of the spines (Fig. 64b). Eyes more or less round (Fig. 66c) .... *Froggattella*

Propodeum with rounded protuberances (Fig. 65aa) and with the spiracle located near the angle between the upper and rear faces (Fig. 65bb). Eyes oval and elongate (Fig.67cc) .... *Turneria*



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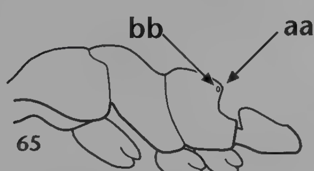

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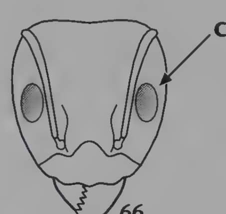

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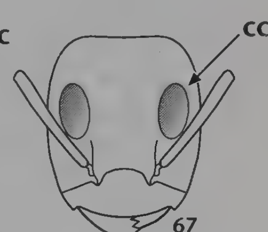

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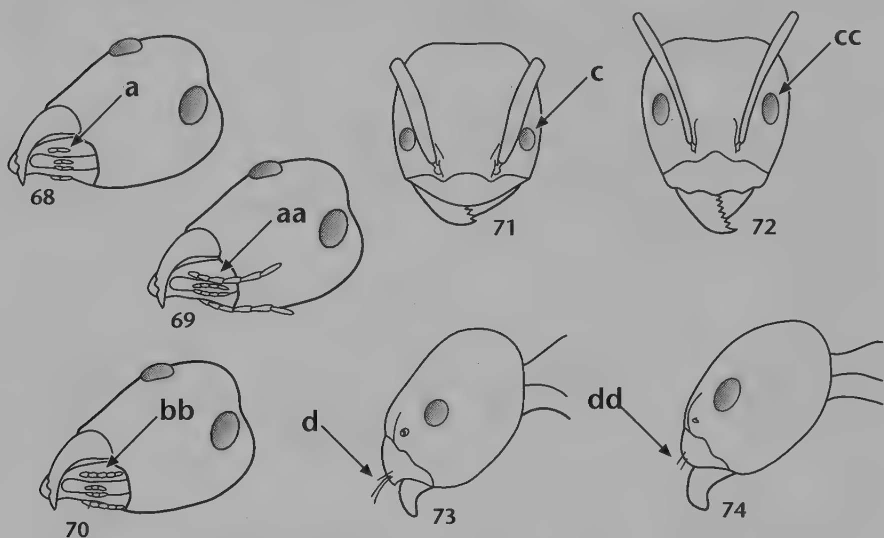
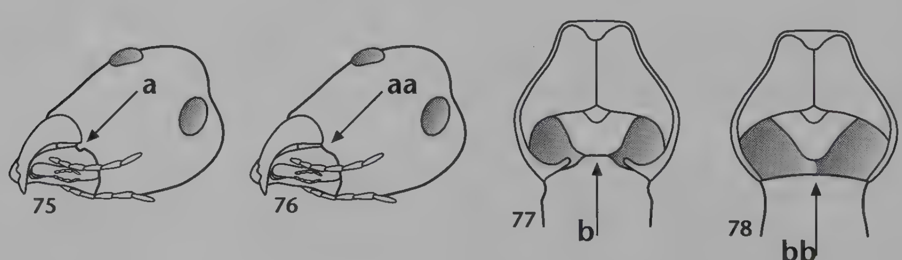
6. Palps always short, not extending along the underside of the head and with a formula of 2:2 (outer (maxillary) and inner (labial) palps each with two segments) (Fig. 68a). Eyes small, with at most about 50 facets (ommatidia) and about the same diameter as the maximum scape diameter (Fig. 71c). Front margin of the clypeus above the mandibles with from 2 to about 12 downwardly curved hairs which are about the same length as the closed mandibles (Fig. 73d) .... *Bothriomyrmex*

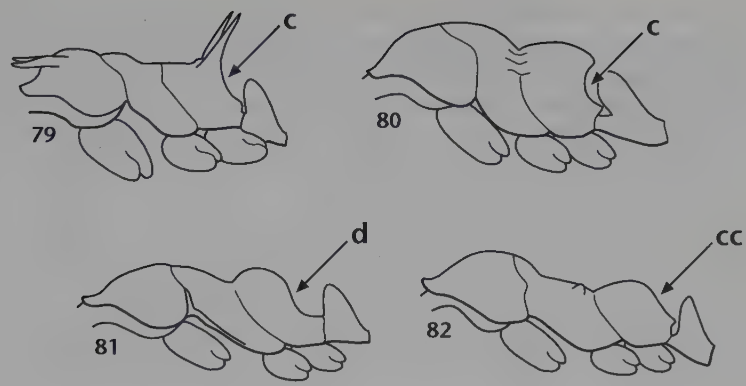
Palps either long and extending along the underside of the head (Fig. 69aa) or shorter and not quite reaching underside of head (Fig. 70bb), and with a formula of 5:3 (Fig. 70bb) or 6:4 (Fig. 69aa) (outer (maxillary) palps with five or six segments, inner (labial) palps with three or four segments). Eyes large, with more than 100 facets (ommatidia) and much larger than the maximum scape diameter (Fig. 72cc). Front margin of the clypeus above the mandibles with 2–20 short, straight (rarely curved) hairs which are much shorter than the closed mandibles (Fig. 74dd) 7



7. Underside of the head near the base of the mandible (lateral hypostoma) with a weak to well-developed flange that is sometimes tooth-like (Fig. 75a). Plates of the underside of the body above the front legs (prosternum and mesosternum, visible only with front legs removed) expanded and overlapping (Fig. 77b). Mesosoma often heavily sculptured. Rear face of the propodeum generally concave (Figs 79c, 80c) but sometimes flat (Fig. 81d) ....*Dolichoderus*

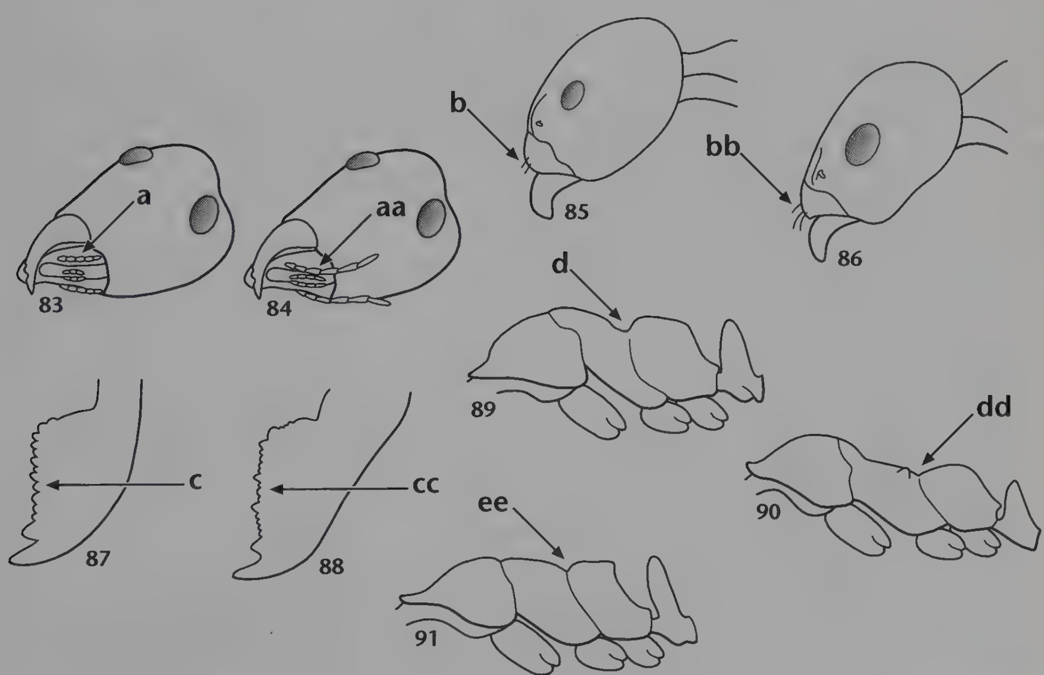
Underside of the head near the base of the mandible (lateral hypostoma) rounded or with at most a ridge, but never with a flange (Fig. 76aa). Plates of the underside of the body above the front legs (prosternum and mesosternum, visible only with front legs removed) separated by an area of membrane (Fig. 78bb). Mesosoma generally weakly sculptured; rear face of the propodeum usually rounded (Fig. 82cc) but sometimes flat or concave 8





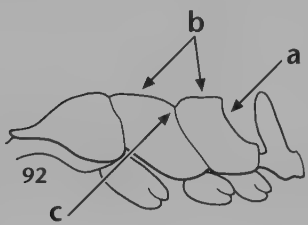
8. Palps short, not reaching underside of head and with a formula of 5:3 (outer (maxillary) palps with five segments, inner (labial) palps with three segments) (Fig. 83a). Front margin of the clypeus above the mandibles with 8–20 very short, straight hairs which only slightly surpass the front clypeal margin and do not overlap the rear section of the mandibles (Fig. 85b). Mandibles with 10–15 teeth which are all approximately the same size (Fig. 87c). Metanotal groove a distinct, deep trough or notch which is depressed below the level of the surrounding upper surfaces of the mesosoma (Fig. 89d) .... ***Papyrius***

Palps long, extending along the underside of the head and with a formula of 6:4 (outer (maxillary) palps with six segments, inner (labial) palps with four segments) (Fig. 84aa). Front margin of the clypeus above the mandibles with 2–16 short erect hairs which noticeably surpass the front clypeal margin and overlap the rear section of the mandibles (Fig. 86bb). Mandibles with 5–12 large teeth and generally at least a few smaller denticles (Fig. 88cc). Metanotal groove a distinct angle (Fig. 90dd) or a narrow groove or notch (Fig. 91ee) 9



9. Rear face of the propodeum concave (Fig. 92a). Upper surface of the mesosoma more or less flat (Fig. 92b). Metanotal groove notch-like (Fig. 92c) ....*Ochetellus*

Rear face of the propodeum convex (rarely nearly flat) (Fig. 93aa). Upper surface of the mesosoma with the propodeum below the mesonotum (Fig. 93bb). Metanotal groove angular (Fig. 93cc) 10



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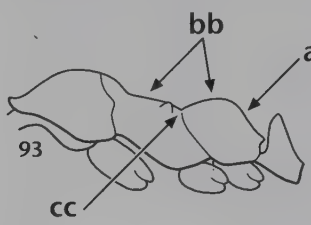

93

10. The front margin of the clypeus above the mandibles with rounded protuberances on each side of a central projection, the projection either pointed or rounded (sometimes weakly developed) (Fig. 94a) 11

The front margin of the clypeus above the mandibles uniformly arched across its width and with the central area broadly concave (Fig. 95aa) to convex (Fig. 96aa) and never with a projection 12

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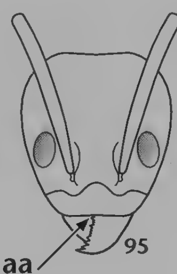

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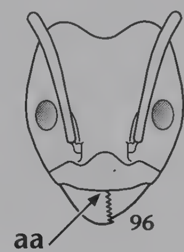
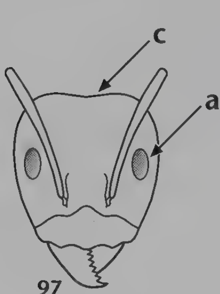


96

11. Eyes placed relatively upwards on the head, away from the clypeus and mandibles (Fig. 97a). Node of the petiole usually upright and with the forward and rearward faces about the same length, only rarely inclined forwards (and with the forward face much shorter than the rearward face) (Fig. 99b). Rear margin of the head generally rounded, occasionally weakly depressed or concave (Fig. 97c) ....*Iridomyrmex*

Eyes placed relatively downwards on the head, closer to the clypeus and mandibles (Fig. 98aa). Node of the petiole strongly inclined forwards and with the forward face much shorter than the rearward face (Fig. 100bb). Rear margin of the head distinctly depressed or concave (Fig. 98cc) ....*Philidris*



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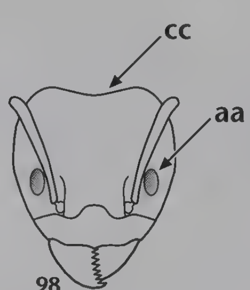

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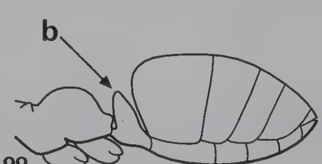

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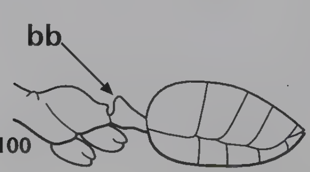
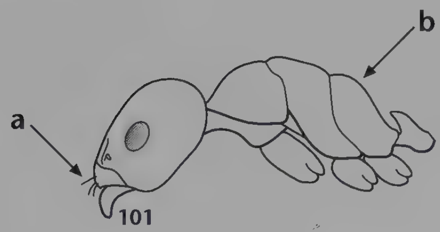
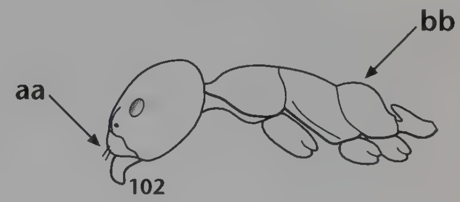


100

12. Hairs on the front margin of the clypeus above the mandibles moderately curved downwards (Fig. 101a). Upper face of the propodeum shorter than the rear face (Fig. 101b) .... *Doleromyrma*

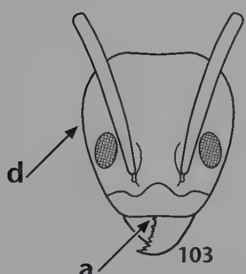
Hairs on the front margin of the clypeus above the mandibles straight (Fig. 102aa). Upper face of the propodeum generally the same length or longer than the rear face (Fig. 102bb) 13

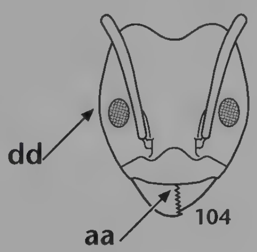


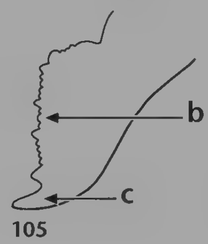


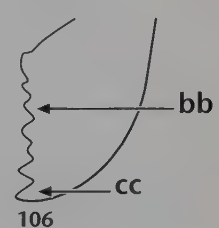
13. Central area of the front margin of the clypeus a broad, swallow concavity (Fig. 103a). Mandibles with 5–8 large teeth and 5–13 small denticles (Fig. 105b) and with the tooth at the tip elongate and much longer than the second tooth (Fig. 105c). Widest point of head well behind the eyes (Fig. 103d) .... *Linepithema*

Central area of the front margin of the clypeus flat or convex (Fig. 104aa). Mandibles with 5–10 large teeth and 0–4 small denticles (Fig. 106bb) and with the tooth at the tip only slightly longer than the second tooth (Fig. 106cc). Widest point of head only slightly behind the eyes (Fig. 104dd) .... *Anonychomyrma*









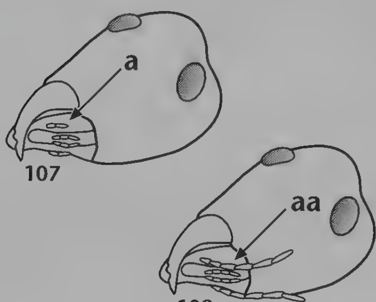
Key to Genera of the Subfamily Formicinae

1. Antennae with 10 or 11 segments (including the scape) 2

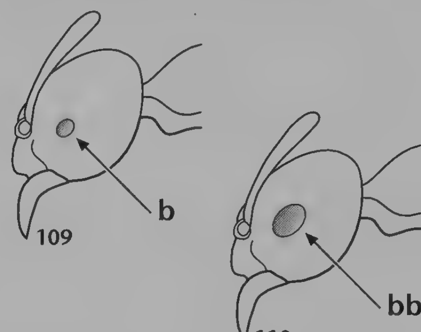
   Antennae with 12 segments (including the scape) 5

2. Palps short, not extending along the underside of the head and with a formula of 2:3 (outer (maxillary) palps with two segments, inner (labial) palps with three segments) (Fig. 107a). Eyes absent or small, at most about the size of the maximum scape diameter (Fig. 109b) . . . . *Acropyga*

   Palps long, extending along the underside of the head and with a formula of 6:4 (outer (maxillary) palps with six segments, inner (labial) palps with four segments) (Fig. 108aa). Eyes present and always larger than the maximum scape diameter (Fig. 110bb) 3



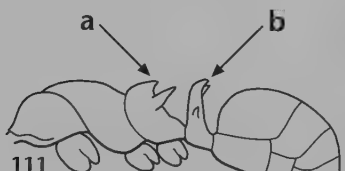
107 108



109 110

3. Propodeum with one or more pairs of spines, teeth or protuberances (sometimes these are small) (Fig. 111a). Upper surface of the petiole usually rounded or angular, but sometimes with a pair of spines (Fig. 111b) . . . . *Stigmacros*

   Propodeum smooth, without spines or teeth (Fig. 112aa). Upper surface of the petiole rounded or angular, never with teeth or spines (Fig. 112bb) 4



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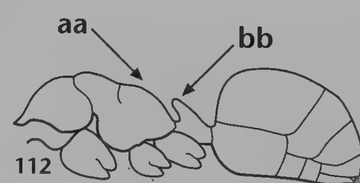
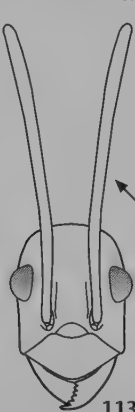


112

4. Scapes surpassing the rear margin of the head by two-thirds their length or more (Fig. 113a). Second and third segments of the antennal funiculus (counting from the scape) about the same length as the fourth segment (Fig. 115b). Body elongate, the pronotum longer than wide when viewed from above (Fig. 117c) . . . . *Anoplolepis*



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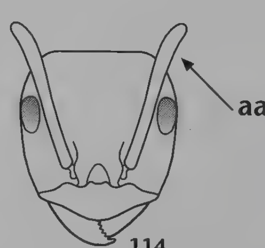
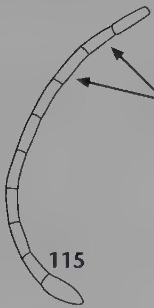
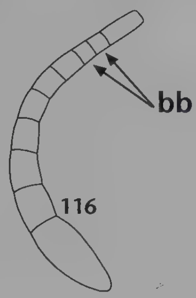
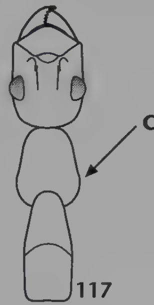


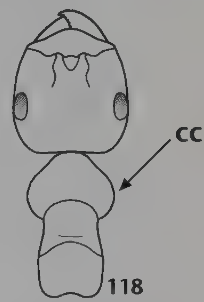
114

Scapes surpassing the rear margin of the head by less than one-quarter their length (Fig. 114aa) and sometimes not surpassing it at all. Second and third segments of the antennal funiculus (counting from the scape) each much shorter than the fourth segment (Fig. 116bb). Body compact, the pronotum shorter than wide when viewed from above (Fig. 118cc) .... *Plagiolepis*



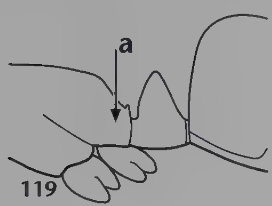


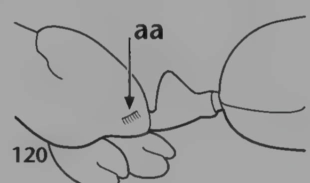




5. Rear corner of the mesosoma above the hind leg smooth or with ridges, but never with an opening (the metapleural gland opening) or row of elongate hairs (although sometimes a few scattered hairs are present) (Fig. 119a). (Note that sometimes the propodeal spiracle is low on the propodeum and located above the hind leg, but it is never below the level of the attachment of the petiole while the metapleural gland opening is always below this point) 6

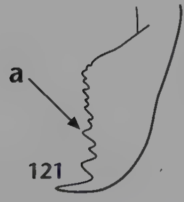
Rear corner of the mesosoma above the hind leg with a small opening (the metapleural gland opening) which is often fringed with elongate hairs (Fig. 120aa) 8

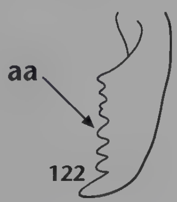


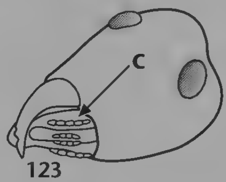


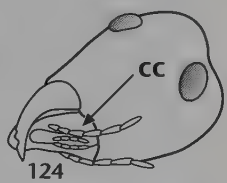
6. Mandibles with ten or more teeth and with the fourth tooth (counting from the tip) longer than the third and fifth teeth (Fig. 121a). Node of the petiole low and rounded (Fig. 125b). Palps short, not extending along the underside of the head and with a formula of 5:4 (outer (maxillary) palps with five segments, inner (labial) palps with four segments) (Fig. 123c). Mesonotum constricted (Fig. 125d) and narrower than the pronotum and propodeum when viewed from above .... *Oecophylla*

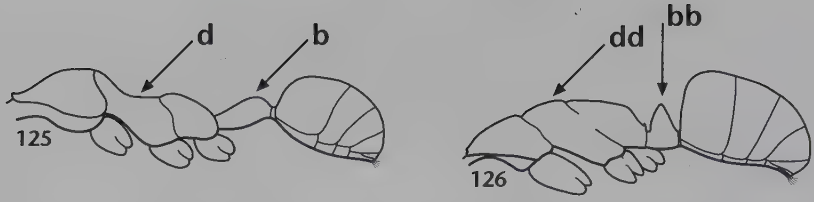
Mandibles with eight or fewer teeth and with the fourth tooth about the same length as the third and fifth teeth (Fig. 122aa). Node of the petiole distinct and upright (Fig. 126bb). Palps long, extending along the underside of the head and with a formula of 6:4 (outer (maxillary) palps with six segments, inner (labial) palps with four segments) (Fig. 124cc). Mesonotum intermediate in width between the pronotum and propodeum (Fig. 126dd) when viewed from above 7





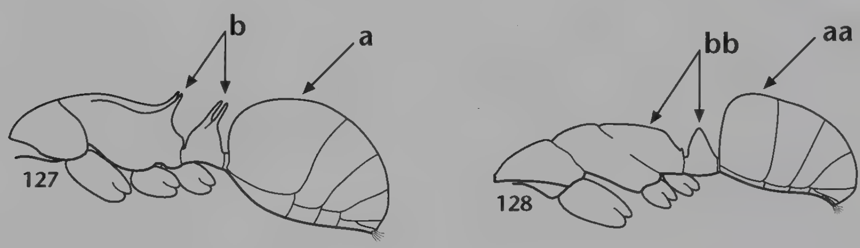






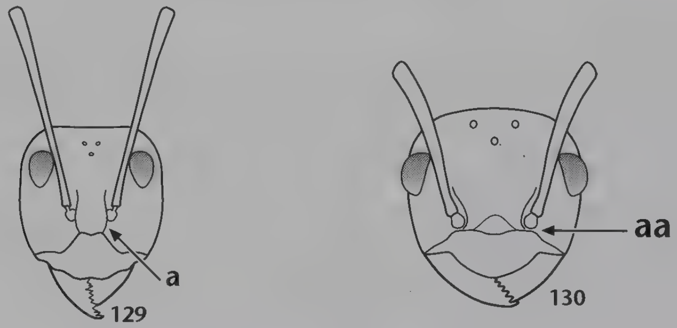
7. Upper plate of the first segment of the gaster (first gastral tergite) varying from slightly less than to more than half the total length of the gaster (Fig. 127a). Spines present on the top of the petiole and usually also on the mesosoma (Fig. 127b) (in a few species the spines on the petiole are reduced to sharp angles) .... *Polyrhachis*

Upper plate of the first segment of the gaster (first gastral tergite) always much less than half the total length of the gaster (Fig. 128aa). Spines absent from the mesosoma and petiole, the petiole rounded or angular above and never with spines (Fig. 128bb) .... *Camponotus*



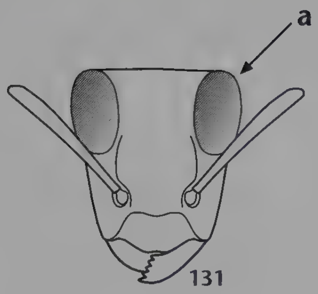
8. Antennal sockets separated from the rear margin of the clypeus by a distance greater than the smallest diameter of the scape (Fig. 129a) 9

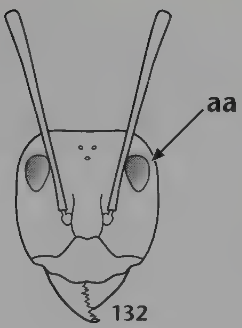
Antennal sockets very close to the rear margin of the clypeus and sometimes almost touching it, the distance between them always less than the smallest diameter of the scape (Fig. 130aa) 12



9. Eyes very large and placed on the rear corners of the head so that they form part of the outline of the head when viewed from the front (Fig. 131a) .... *Opisthopsis*

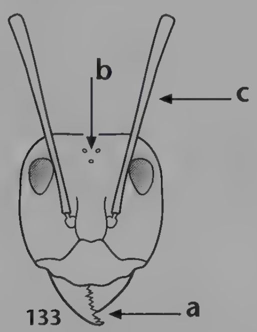
Eyes moderate in size and placed along the side of the head, never near the rear corners and never forming part of the outline of the head when viewed from the front (although they may bulge outwards past the sides of the head) (Fig. 132aa) 10

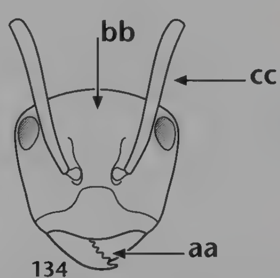




10. Mandibles with more than ten teeth (Fig. 133a). Ocelli present (Fig. 133b). Scapes long, surpassing the rear margin of the head by one half their length or more (Fig. 133c). Overall length of body (including head) 10 mm or greater. Workers highly variable in size and varying continuously from majors to minors (polymorphic). ...... *Notostigma*

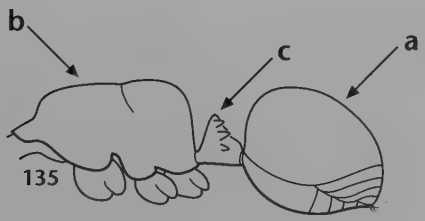
Mandibles with five or six teeth (Fig. 134aa). Ocelli absent (Fig. 134bb). Scapes short, surpassing the rear margin of the head by less than one half their length (Fig. 134cc). Overall length of body (including head) less than 10 mm. All workers approximately the same size (monomorphic). 11

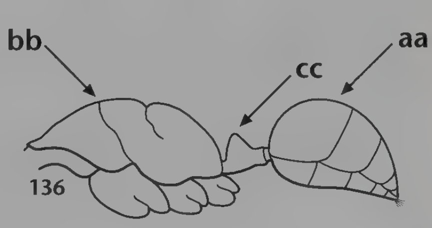




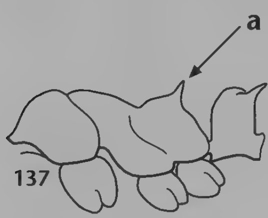
11. Upper plate of the first segment of the gaster (first gastral tergite) more than half the total length of the gaster (Fig. 135a). Pronotum and mesonotum forming a single plate which is not separated by a suture (best viewed from above) (Fig. 135b). Node of the petiole expanded towards the sides so that it is wider than the propodeum, its upper surface flat or slightly concave and with teeth along its outer edges (Fig. 135c) .... *Echinopla*

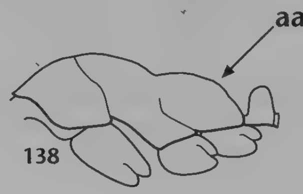
Upper plate of the first segment of the gaster (first gastral tergite) less than half the total length of the gaster (Fig. 136aa). Pronotum and mesonotum separated by a suture (best viewed from above) (Fig. 136bb). Node of the petiole much narrower than the propodeum, its upper and outer surfaces rounded and never with spines or teeth (Fig. 136cc) .... *Calomyrmex*



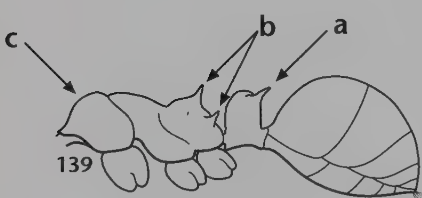


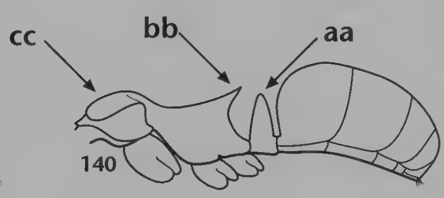
12. Propodeum armed with a pair of distinct, elongate spines near the angle between its upper and rear faces (Fig. 137a) 13
Propodeum usually rounded and without spines, but occasionally with very small denticles which each bear an elongate hair (Fig. 138aa) 14

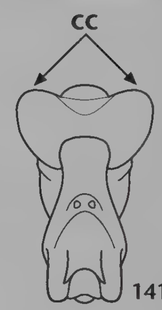




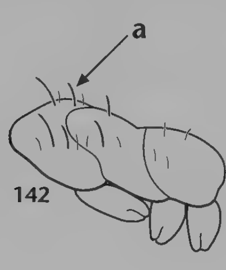
13. Petiole with a pair of teeth on its upper surface (Fig. 139a). Propodeum with two pairs of spines (Fig. 139b). Pronotum rounding from the top into the sides (Fig. 139c) . . . . *Pseudonotoncus*
Petiole angled above but without teeth (Fig. 140aa). Propodeum with a single pair of spines (Fig. 140bb). Pronotum with a pair of wing-like projections on its outer edges between the upper surface and sides (Figs 140cc, 141cc) . . . . *Teratomyrmex*

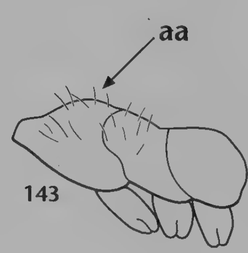




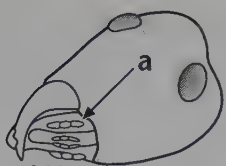


14. Upper surface of the head and body with pairs of large, stout, dark hairs (Fig. 142a) . . . . *Paratrechina*
Upper surface of the body with randomly placed, relatively thin hairs which are not found in pairs and are often lightly coloured (Fig. 143aa), or lacking hairs 15





15. Palps short, not extending along the underside of the head and with a formula of 2:3, 3:3 or 4:3 (outer (maxillary) palps with two, three or four segments, inner (labial) palps with three segments) (three maxillary and three labial palps shown in Fig. 144a) . . . . *Pseudolasius*
Palps long, extending along the underside of the head and with a formula of 6:4 (outer (maxillary) palps with six segments, inner (labial) palps with four segments) (Fig. 145aa) 16



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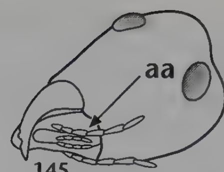

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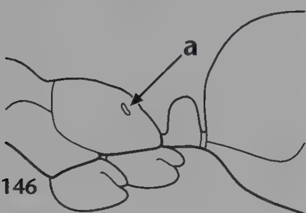
16. Spiracle on the propodeum slit-like or comma-shaped (Fig. 146a). Underside of the head and mandibles usually with numerous elongate curved hairs (a psammophore) (Fig. 148b), but sometimes with only a few hairs on the underside of the head . . .*Melophorus*

Spiracle on the propodeum round or oval (Fig. 147aa). Underside of head and mandibles without elongate curved hairs (a psammophore), at most with short, straight hairs (Fig. 149bb) 17



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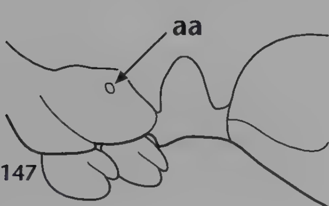

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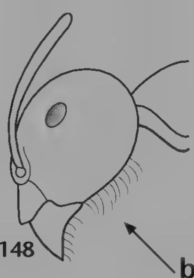

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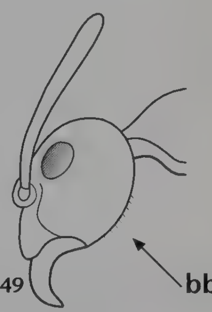

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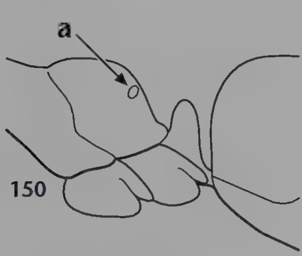
17. Spiracle on propodeum located very close to the rear face in side view (Fig. 150a). Scapes long, surpassing the rear margin of the head by at least three times their maximum diameter and often by more than one-third their length (Fig. 152b) . . . .*Prolasius*

Spiracle on propodeum located at least its diameter forward of the rear face in side view (Fig. 151aa). Scape variable in length but never surpassing the rear margin of the head by more than one-third their length and often surpassing it by less than three times their maximum diameter (Fig. 153bb) 18



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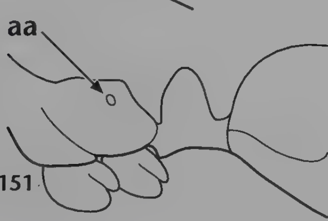

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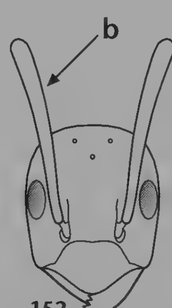

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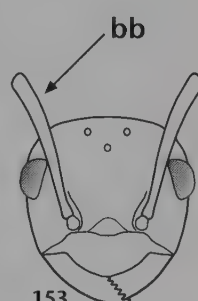

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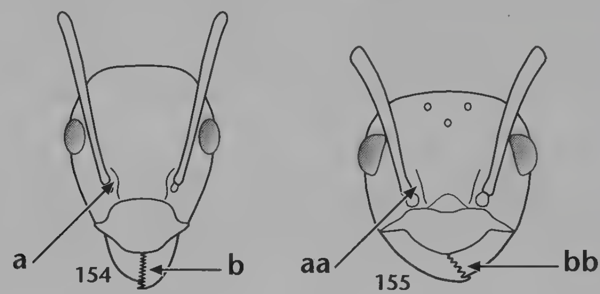
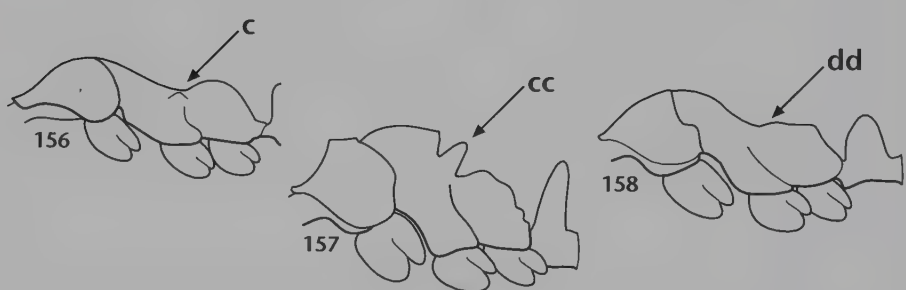
18. Frontal carinae distinctly arched (Fig. 154a). Mandible usually with 10–13 teeth (Fig. 154b), but sometimes with as few as six in large individuals. Workers highly variable in size and varying continuously from majors to minors (polymorphic). Upper surface of mesosoma between the metanotum and propodeum always low and flat or concave (Fig. 156c) . . . . *Myrmecorhynchus*

Frontal carinae weakly arched or flat along their entire length (except the extreme forward ends near the antennal sockets, which are curved) (Fig. 155aa). Mandible with six or seven teeth (Fig. 155bb). Worker caste only slightly variable in size (monomorphic). Upper surface of mesosoma between the mesonotum and propodeum either expanded upwards into a rounded or angular process (Fig. 157cc) or flat (Fig. 158dd) . . . . *Notoncus*

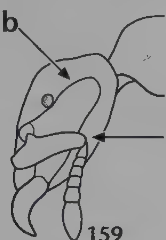


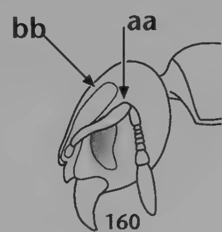


KEY TO THE GENERA OF THE SUBFAMILY MYRMICINAE

1. Antennal scape, when laid back against the head in its normal resting position, passing either below the eye (Fig. 159a) or across its lower margin. Distinct, elongate depressions (antennal scrobes) which contain the entire antennae when at rest sometimes present on the front of the head and, when present, running below the eyes (Fig. 159b). 2

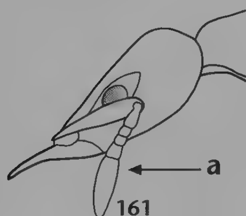
   Antennal scape, when laid back against the head in its normal resting position, passing above the eye and along the upper surface of the head (Fig. 160aa) (or, if the eyes are absent, then the scape passes along the upper surface of the head above where the eye would be expected to occur). Distinct, elongate depressions (antennal scrobes) which contain the entire antennae when at rest sometimes present on the front of the head and, when present, running above the eyes (Fig. 160bb) 6

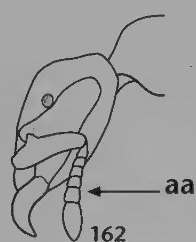




2. Antennae with 4–6 segments (including the scape) (Fig. 161a, with six segments). Palp formula 5:3 (outer (maxillary) palps with five segments, inner (labial) palps with three segments) (Fig. 163b) 3

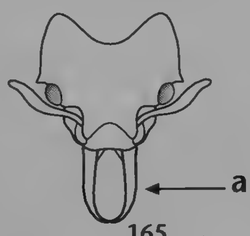
   Antennae with seven segments (including the scape) (Fig. 162aa). Palp formula 2:2 or less (outer (maxillary) and inner (labial) palps each with at most two segments) (Fig. 164bb) 5

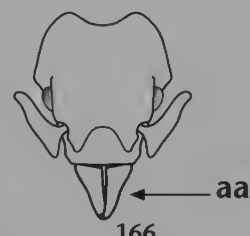




3. Mandibles thin and elongate, when fully closed they are separated by a broad gap for most of their length and touch only at the tips (Fig. 165a) . . . .*Epopostruma*

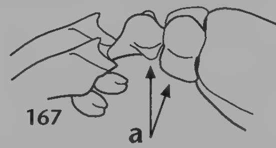
   Mandibles triangular to elongate-triangular, when fully closed they touch or nearly touch along their entire length (Fig. 166aa) 4

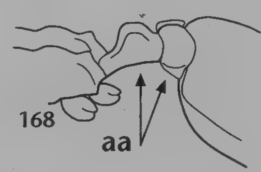




4. Sides of the petiole and postpetiole with thin, wing-like flanges (best viewed from above) (Fig. 167a) . . . . *Colobostruma*

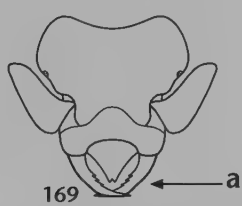
Sides of the petiole rounded or with at most a slight ridge, the wing-like flanges found only on the postpetiole (Fig. 168aa) . . . . *Mesostruma*

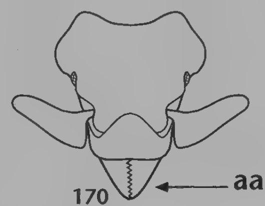




5. Mandibles thin and elongate, when fully closed they are separated by a broad gap for most of their length and touch only at the tips (Fig. 169a) . . . . *Rhopalothrix*

Mandibles triangular, when fully closed they touch or nearly touch along their entire length (Fig. 170aa) . . . . *Eurhopalothrix*



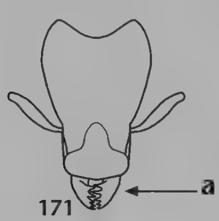


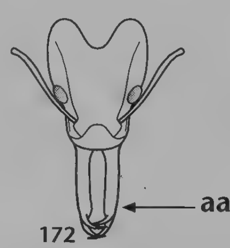
6. Antennae with 4–6 segments (including the scape) 7

Antennae with 9–12 segments (including the scape) 11

7. Mandibles short, triangular or nearly so, and with teeth along their entire inner margins (Fig. 171a) 8

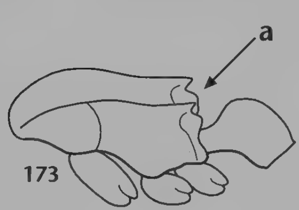
Mandibles thin, elongate and with only two or three teeth at their extreme tips (Fig. 172aa) 9

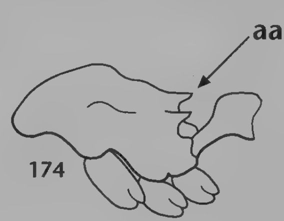


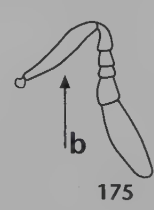


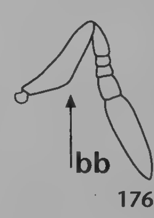
8. Rear face of the propodeum with a pair of thin, vertical flanges (Fig. 173a). Outer surface of the scape uniformly curved (Fig. 175b) . . . . *Glamyromyrmex*

Rear face of the propodeum armed with a pair of spines or teeth near its upper surface (Fig. 174aa). Outer surface of the scape angular (Fig. 176bb) . . . . *Trichoscapa*

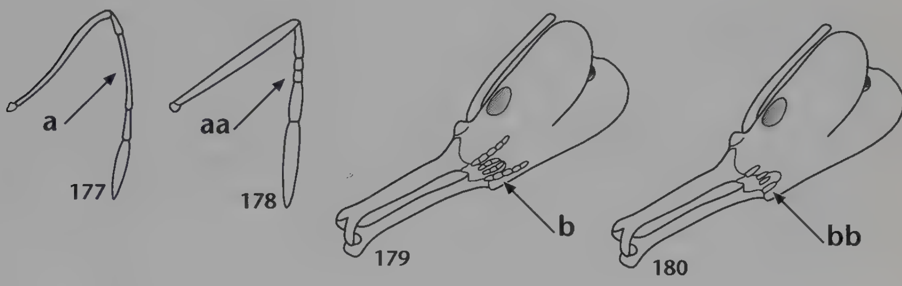






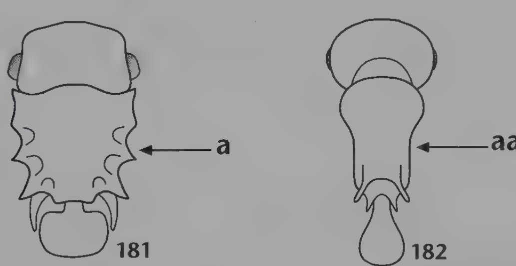


9. Antennae with five segments (including the scape), and with the third segment from the tip elongate and much longer than the other segments of the funiculus (Fig. 177a). Palp formula 5:3 (outer (maxillary) palps with five segments, inner (labial) palps with three segments) (Fig. 179b). . . . . *Orectognathus*
   Antennae with four or six segments (including the scape), and with the third segment from the tip about the same length or shorter than the other segments of the funiculus (Fig. 178aa). Palp formula 1:1 (both outer (maxillary) and inner (labial) palps with a single segment) (Fig. 180bb). 10

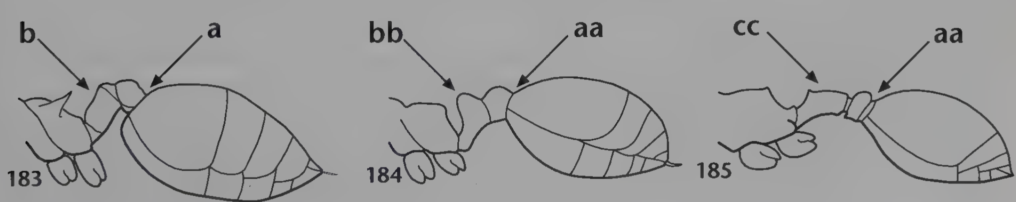


10. Antennae with four segments (including the scape) . . . . *Quadristruma*
   Antennae with six segments (including the scape) . . . . *Strumigenys*

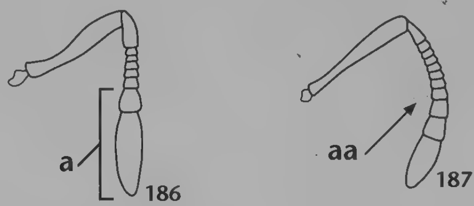
11. Antennae with nine segments (including the scape). Upper surface of the mesosoma forming a broad shield with thin, sharp lateral edges which project outwards over the sides of the mesosoma (Fig. 181a) . . . . *Meranoplus*
   Antennae with 9–12 segments (including the scape). Upper surface of the pronotum and mesonotum usually rounding gradually into the sides of the mesosoma (Fig. 182aa), or at most separated by a distinct angle or ridge, but never a thin flange-like projection 12



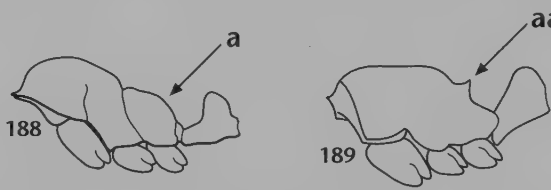
12. Postpetiole attached to the upper surface of the gaster (Fig. 183a). Gaster when viewed from above roughly heart-shaped. Petiole without a node (Fig. 183b) . . . . *Crematogaster*
   Postpetiole attached to the front of the gaster (Figs 184aa, 185aa). Gaster when viewed from above not particularly heart-shaped. Petiole usually with a node (Fig. 184bb) but sometimes roughly cylindrical or barrel-shaped (Fig. 185cc) 13



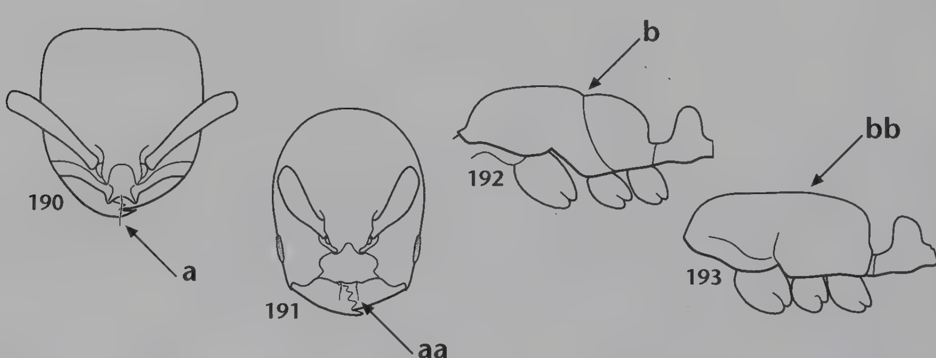
13. First and second segments of the antennae (those nearest the tip) much longer than the remaining segments (excluding the scape) and forming a conspicuous two-segmented club (Fig. 186a) 14
Antennae either without a distinct club, or with a club of three or more segments (Fig. 187aa) 19



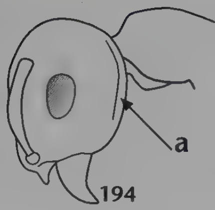
14. Rear face of the propodeum rounded or with at most low, rounded ridges or protuberances, but never with teeth, spines or thin flanges (Fig. 188a) 15
Rear face of the propodeum armed with teeth or spines which vary from short and angular (Fig. 189aa) to long and thin, or occasionally propodeum with thin, elongate flanges 16



15. Front margin of the clypeus just above the mandibles with a single central elongate hair or seta (Fig. 190a) which is often surrounded by paired hairs or setae. In side view the upper surface of the mesosoma with a distinct impression at the metanotal groove (Fig. 192b) . . . . *Solenopsis*
Front margin of the clypeus just above the mandibles with pairs of elongate hairs or setae which straddle the mid-line of the head (Fig. 191aa). In side view the upper surface of the mesosoma smooth, without an impression at the metanotal groove (Fig. 193bb) . . . . *Rhopalomastix*



16. Antennae with 12 segments (including the scape). Sides of the head behind the eyes with an elongate ridge on each side which starts above the mandibles and ends near the upper corners (Fig. 194a) . . . . **Unnamed Genus #1**
Antennae with 9–11 segments (including the scape). Sides of the head behind the eyes smooth or uniformly sculptured, but never with an elongate ridge (Fig. 195aa) 17



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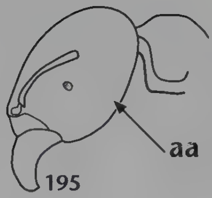

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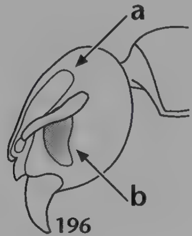
17. Distinct, elongate depressions (antennal scrobes) present on the front of the head, which contain the entire antennae when at rest (Fig. 196a). Eyes elongate and with the lower section narrowed into a point (Fig. 196b). All workers approximately the same size (monomorphic) . . . . *Mayriella*

Front of the head smooth and without elongate depressions (antennal scrobes) (Fig. 197aa). Eyes small and round (Fig. 197bb). Workers highly variable in size (dimorphic or polymorphic) 18



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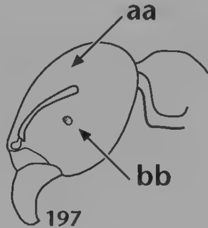

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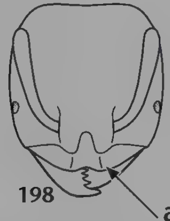
18. Clypeus with a pair of longitudinal ridges or sharp angles immediately below the antennal sockets which separate the central region from the lateral regions (clypeus longitudinally bicarinate) (Fig. 198a). Workers very small (overall body length less than 1.5 mm) and with majors and minors but without intermediates (dimorphic) . . . . *Oligomyrmex*

Clypeus smooth across its entire width and without longitudinal ridges or angles (Fig. 199aa). Workers highly variable in size (ranging from 1.4 mm to 7.0 mm in overall body length) and varying continuously from majors to minors (polymorphic) . . . . *Pheidologeton*



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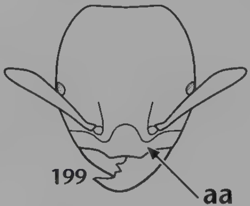

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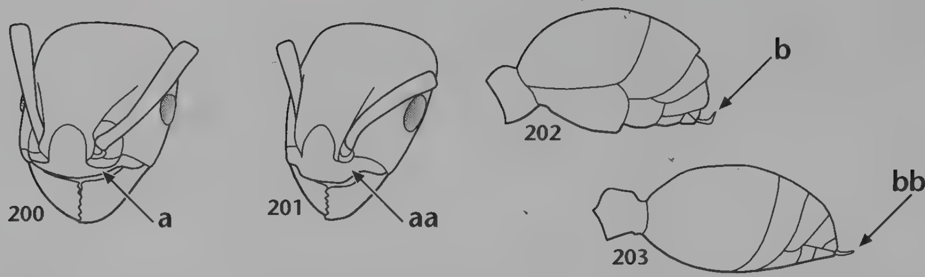
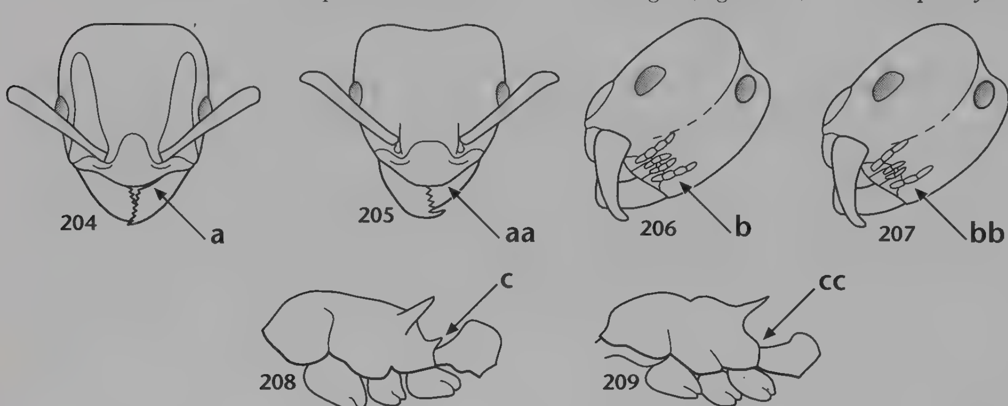
19. Area of the clypeus immediately below the antennal sockets raised into a sharp-edged ridge (Fig. 200a). Tip of the sting with a triangular to pennant-shaped extension projecting upwards from the shaft (visible only when the sting is extended) (Fig. 202b) 20

Area of the clypeus immediately below the antennal sockets usually smooth (Fig. 201aa) but occasionally in the form of a ridge. Tip of the sting thin and pointed (Fig. 203bb) or slightly flattened and swollen 21



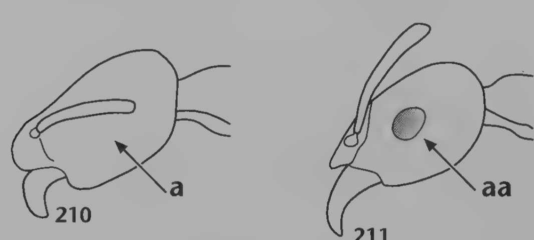
20. When viewed from the front, head roughly square or rectangular-shaped with a flat to weakly concave rear margin, weakly convex sides and with the front margin of the clypeus weakly convex, flat or weakly concave and covering only the extreme rear section of the mandibles (Fig. 204a). Lower surface of the petiole rounded from side to side (best viewed from below). Palp formula usually 4:3 (outer (maxillary) palps with four segments, inner (labial) palps with three segments), rarely with fewer segments (Fig. 206b). Propodeum near the insertion of the petiole often with a pair of spine-like flanges (Fig. 208c) although sometimes with rounded flanges .... ***Tetramorium***

When viewed from the front, head roughly heart-shaped with a concave rear margin, convex sides and with the front margin of the clypeus strongly arched and projecting forward over the rear section of the mandibles (Fig. 205aa). Lower surface of the petiole ridged and keel-like (best viewed from below). Palp formula 3:2 (outer (maxillary) palps with three segments, inner (labial) palps with two segments) (Fig. 207bb). Propodeum near the insertion of the petiole with short, rounded flanges (Fig. 209cc) ..... ***Rhoptromyrmex***



21. Eyes absent (Fig. 210a) .... ***Anillomyrma***

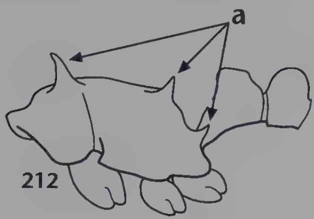
Eyes present (Fig. 211aa) although occasionally reduced to only a few facets (ommatidia) 22

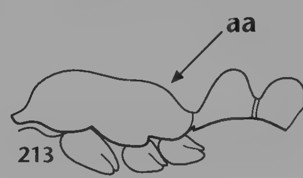


22. Antennae with 10 or 11 segments (including the scape) 23

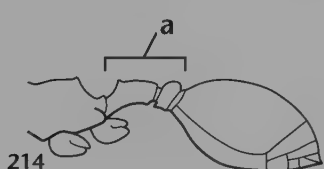
Antennae with 12 segments (including the scape) 30

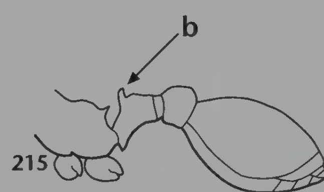
23. Pairs of spines or strong denticles present on the pronotum and on the propodeum near the angle as well as near the attachment of the petiole (Fig. 212a) .... *Pristomyrmex*
Spines or denticles usually absent from the mesosoma (Fig. 213aa), but if present, limited to near the propodeal angle .... .24

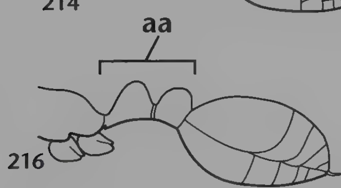


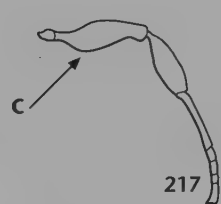


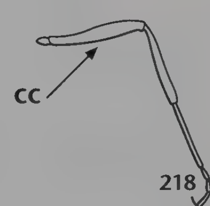
24. In side view, the petiole and postpetiole are either low, rounded and barrel shaped (Fig. 214a), or the petiole is armed above with 1–3 small spines or teeth (Fig. 215b). Middle and hind legs with greatly swollen femora (and often tibiae as well) (Fig. 217c) .... *Podomyrma*
In side view, the petiole and postpetiole with distinct, arched nodes on their upper surfaces (Fig. 216aa), the petiole sometimes with a sharp angle above, but never with a tooth or spine. Middle and hind legs with only weakly swollen femora and tibiae (Fig. 218cc) .... .25



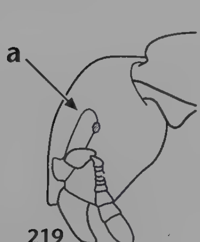


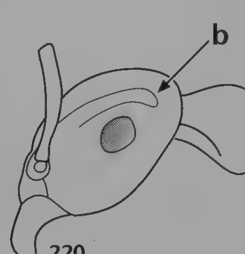


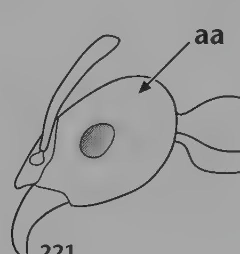




25. Upper surface of the head with a pair of narrow and deep grooves (Fig. 219a) or very feeble depressions (Fig. 220b) (antennal scrobes) for the reception of the antennal scapes when at rest, which are bounded above by conspicuous or interrupted ridges (frontal carinae) .... .26
Upper surface of the head lacking grooves for the reception of the antennal scapes (Fig. 221aa) .... .27

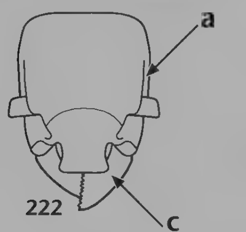






26. Grooves on the upper surface of the head (antennal scrobes) narrow and deep, and partially overhung by the medial sections of the head so their lower surfaces are partially concealed when viewed from the front (Figs 222a, 223a). Eyes small and located on the lower edge of the antennal scrobe (Fig. 223b). Front margin of the clypeus with a rectangular projection which extends forwards over the rear section of the mandibles (Fig. 222c). In side view, the petiole and postpetiole with their upper surfaces broad and flat to weakly convex (Fig. 223d) . . . . ***Metapone***

Grooves on the upper surface of the head (antennal scrobes) broad and shallow and completely visible when viewed from the front (Figs 224aa, 225aa). Eyes large and located well below the antennal scrobe (Figs 224bb, 225bb). Front margin of the clypeus broadly convex and projecting only slightly forwards over the extreme rear section of the mandibles (Fig. 224cc). In side view, the petiole and postpetiole with high, conical, pointed nodes on their upper surfaces (Fig. 225dd) . . . . . ***Peronomyrmex***



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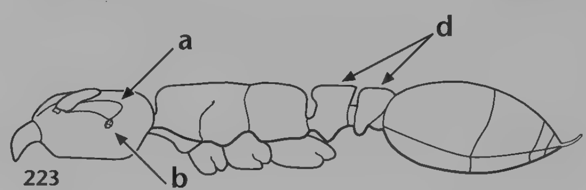

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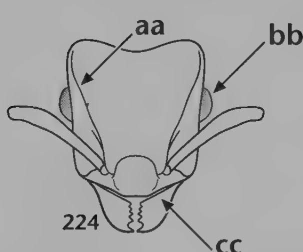

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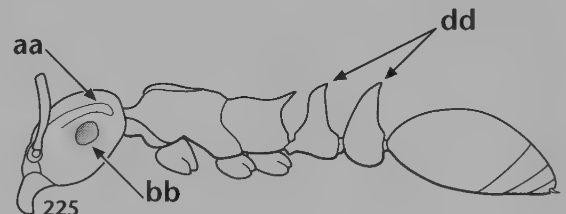

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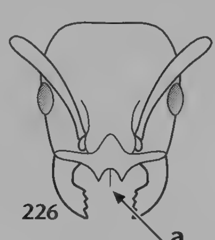
27. Front margin of the clypeus just above the mandibles with a single, central elongate hair or seta (Fig. 226a) which is often surrounded by paired hairs or setae . . . . ***Monomorium*** (in part)

Front margin of the clypeus just above the mandibles with pairs of elongate hairs or setae which straddle the mid-line of the head (Fig. 227aa) 28



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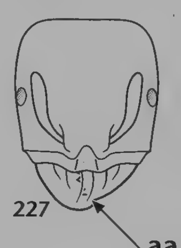

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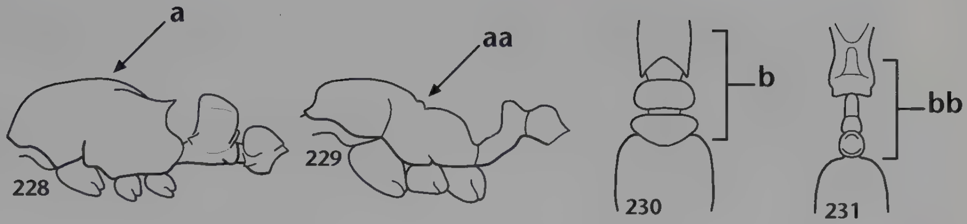
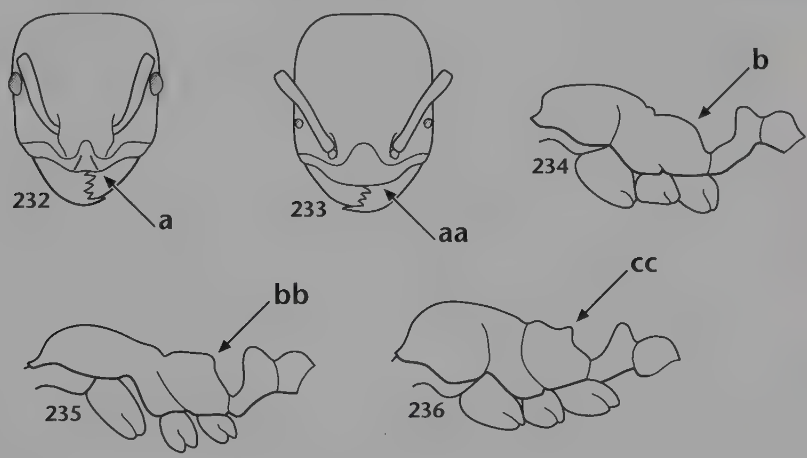
28. Upper surface of the mesosoma evenly convex and without a metanotal groove (Fig. 228a). When viewed from above the petiole and postpetiole are very broad, about the same width as the propodeum (Fig. 230b) . . . . ***Willowsiella***

Upper surface of the mesosoma interrupted by an impressed or angular metanotal groove (Fig. 229aa). When viewed from above the petiole and postpetiole are much narrower than the propodeum (Fig. 231bb) 29



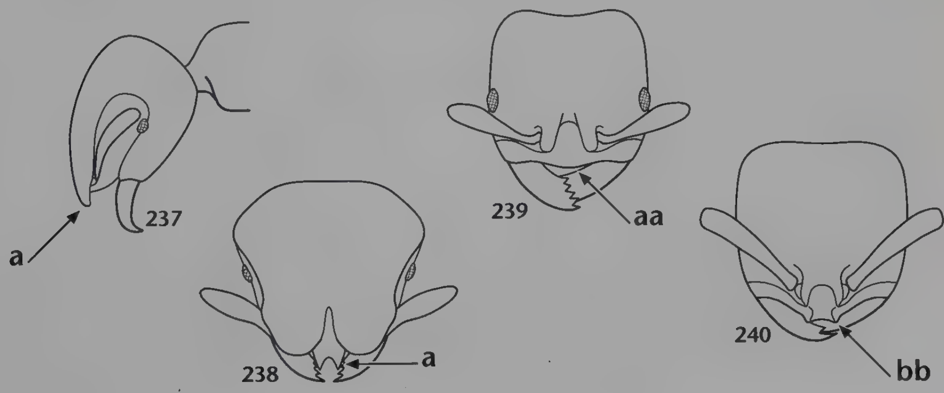
29. Clypeus with a pair of weak, longitudinal ridges or sharp angles immediately below the antennal sockets which separate the central region from the lateral regions (clypeus longitudinally bicarinate) (Fig. 232a). Propodeum rounded, lacking sharp angles or spines (Fig. 234b) . . . . *Adlerzia*

Clypeus smooth across its entire width and without longitudinal ridges or angles (Fig. 233aa). Propodeum armed with sharp angles (Fig. 235bb) or short spines (Fig. 236cc) . . . . *Machomyrma*



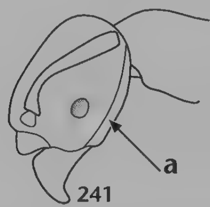
30. Front margin of the clypeus with a conspicuous, broad, bilobed appendage (the clypeal fork) which projects over the rear section of the mandibles (Figs 237a, 238a) . . . . *Calyptomyrmex*

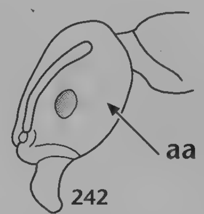
Front margin of the clypeus broadly convex (Fig. 239aa) or with at most a pair of short teeth (Fig. 240bb) 31



31. Sides of the head behind the eyes with an elongate ridge or groove on each side, which starts at the mandibles and runs the length of the head, ending near the upper corners (Fig. 241a) 32

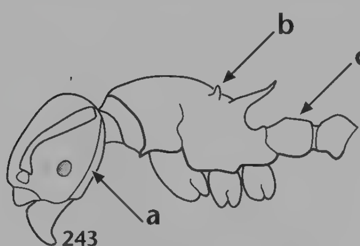
Sides of the head behind the eyes either smooth or sculptured, but when sculptured, never with an elongate ridge or groove which runs the length of the head (Fig. 242aa) 33

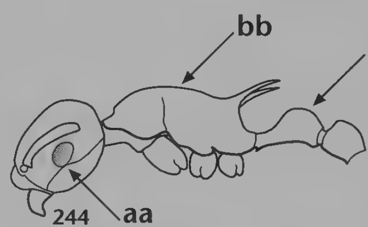




32. Ridge or groove on the side of the head passing well below the eye (Fig. 243a). Upper surface of the propodeum near the metanotal groove armed with low spines or small teeth (Fig. 243b). In side view, the petiole low and without a distinct node (Fig. 243c) . . . . *Myrmecina*

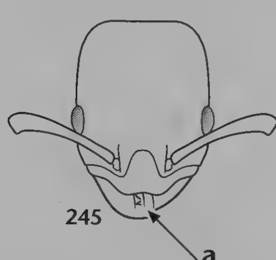
Ridge or groove on the side of the head touching the eye (Fig. 244aa). Upper surface of the propodeum near the metanotal groove smooth (Fig. 244bb). In side view, the petiole with a distinct, arched node on its upper surface (Fig. 244cc) . . . . . . *Vombisidris*

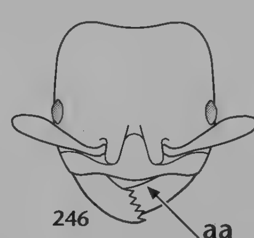




33. Front margin of the clypeus just above the mandibles with a single central elongate hair or seta (Fig. 245a) which is often surrounded by paired hairs or setae 34

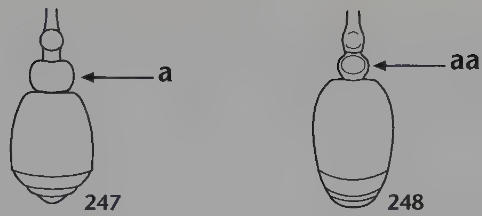
Front margin of the clypeus just above the mandibles with pairs of elongate hairs or setae which straddle the mid-line of the head, or with numerous hairs across most of its width, or lacking hairs (Fig. 246aa) 35





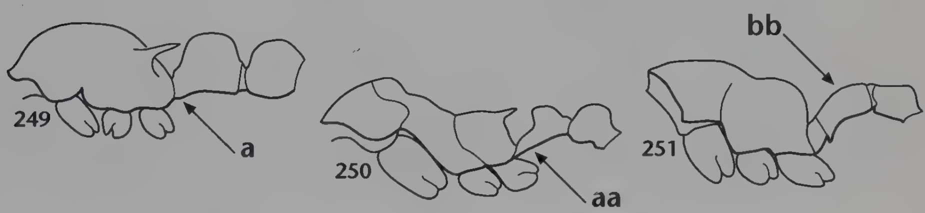
34. Postpetiole swollen, wider than long and much broader than the petiole when viewed from above (Fig. 247a). Outer (maxillary) palp with five segments. . . . . . . *Cardiocondyla*

Postpetiole approximately square, at most only slightly wider than long, and only slightly broader than the petiole when viewed from above (Fig. 248aa). Outer (maxillary) palp with one or two segments . . . . *Monomorium* (in part)



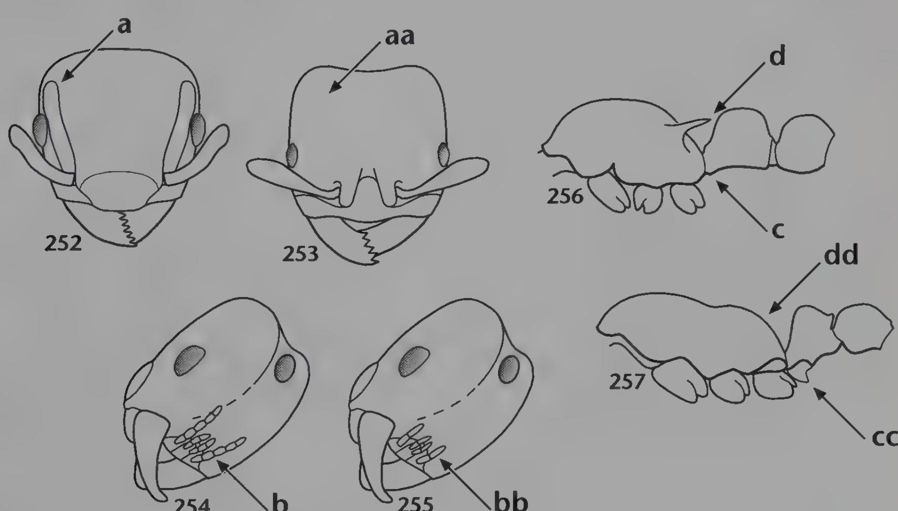
35. Node of the petiole about the same length as the petiole so that there is only a very short narrow section (peduncle) in front of the node (Fig. 249a) 36

Node of the petiole either much shorter than the length of the petiole, and the petiole with a distinct narrow section (peduncle) in front of the node (Fig. 250aa), or lacking and the petiole low, rounded and barrel-shaped (Fig. 251bb) 37



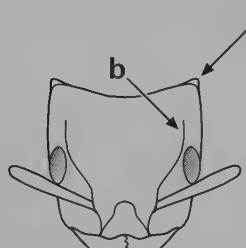
36. Upper surface of the head with a pair of shallow grooves (antennal scrobes) for the reception of the antennal scapes when at rest, these grooves bounded above by ridges (frontal carinae) (Fig. 252a). Palp formula 5:3 (outer (maxillary) palps with five segments, inner (labial) palps with three segments) (Fig. 254b). Lower surface of the petiole with a small tooth or angle (Fig. 256c) near the attachment with the propodeum. Propodeum armed with a pair of long, stout spines (Fig. 256d) . . . .*Romblonella*

Upper surface of the head lacking grooves for the reception of the antennal scapes (Fig. 253aa). Palp formula 2:2 (both outer (maxillary) and inner (labial) palps with two segments each) (Fig. 255bb). Lower surface of the petiole near the propodeum with a large rounded or angular plate (Fig. 257cc). Propodeum rounded (Fig. 257dd) or at most with a pair of small, triangular teeth . . . .*Vollenhovia*



37. When viewed from the front, the rear corners of the head are sharply angular or pointed (Fig. 258a). Upper surface of the head with a pair of shallow grooves (antennal scrobes) for the reception of the antennal scapes when at rest (Fig. 258b). Propodeum rounded and without spines (Fig. 260c). In side view the petiole is low, rounded and barrel shaped (Fig. 260d) . . . . *Dilobocondyla*

When viewed from the front, the rear corners of the head are broadly to narrowly rounded (Fig. 259aa). Upper surface of the head with or without a pair of shallow grooves (antennal scrobes) for the reception of the antennal scapes when at rest (Fig. 259bb). Propodeum with or without a pair of spines or teeth (Fig. 261cc). In side view the petiole with a distinct, arched node on its upper surface (Fig. 261dd) 38



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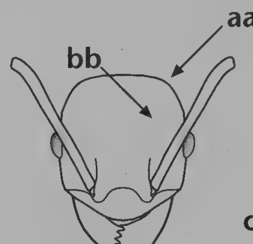

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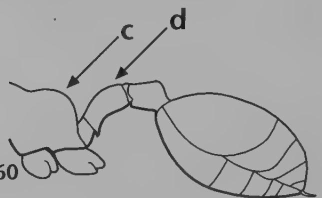

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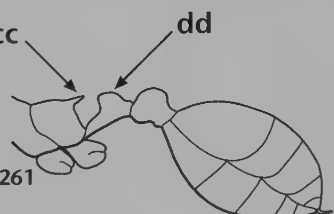

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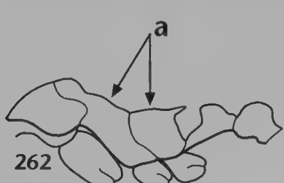
38. In side view the propodeum is depressed below the pronotum and forward section of the mesonotum and the rear section of the mesonotum forms a steep slope between them (Fig. 262a) 39

In side view the upper surface of the propodeum is approximately even with the pronotum and mesonotum so that the upper surface of the mesosoma forms a uniform arch interrupted only by the shallow metanotal groove (Fig. 263aa) 40



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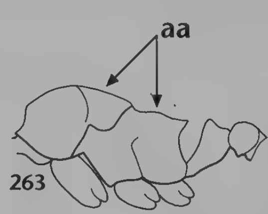

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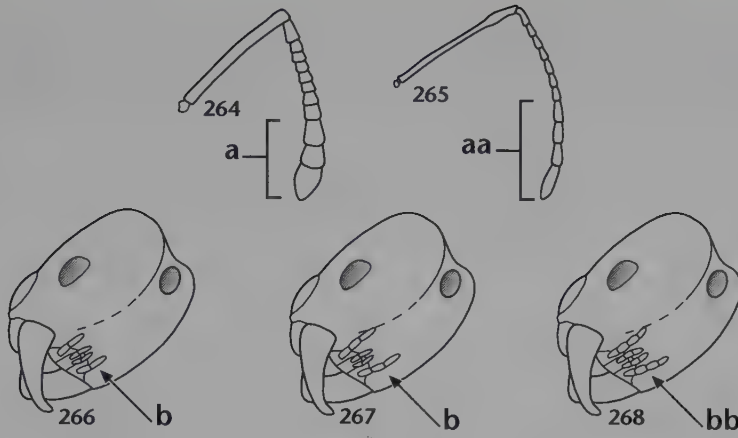
39. Antennae with a three-segmented club (Fig. 264a). Palp formula 2:2 or 3:2 (outer (maxillary) palps with two or three segments, inner (labial) palps with two segments) (Figs 266b, 267b). Overall body size variable, but often less than 3.4 mm long. Workers with majors and minors but without intermediates (dimorphic) . . . . *Pheidole*

Antennae with a four-segmented club (Fig. 265aa). Palp formula 4:3 (outer (maxillary) palps with four segments, inner (labial) palps with three segments) (Fig. 268bb). Overall body size greater than 3.4 mm long. All workers approximately the same size (monomorphic) . . . . *Aphaenogaster*

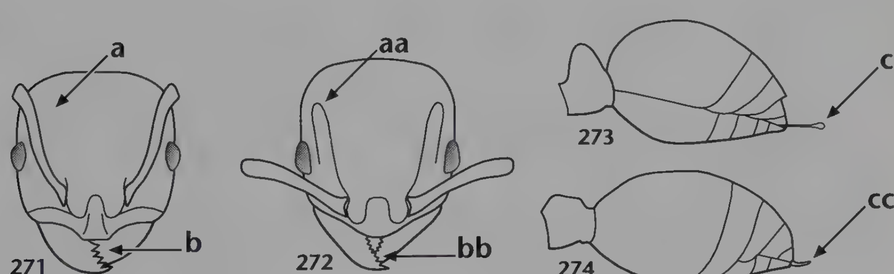


40. Eyes small, with at most four facets (ommatidia) in greatest diameter, and round or nearly round (Fig. 269a) . . . . *Anisopheidole*

Eyes large, with eight or more facets (ommatidia) in greatest diameter, and distinctly oval or elongate (Fig. 270aa) 41

41. Upper surface of the head lacking grooves for the reception of the antennal scapes when at rest (Fig. 271a). Mandibles with four or five teeth (Fig. 271b). Tip of the sting broad, flat and rounded (visible only when sting extended) (Fig. 273c) . . **Unnamed Genus #2**

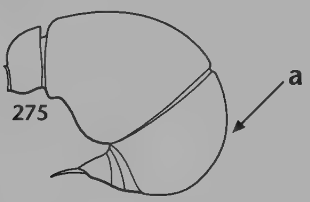
Upper surface of the head with or without a pair of shallow grooves (antennal scrobes) for the reception of the antennal scapes when at rest (Fig. 272aa). Mandibles with 6–10 teeth (Fig. 272bb). Tip of the sting a thin, sharp point (visible only when sting extended) (Fig. 274cc) . . . . *Lordomyrma*

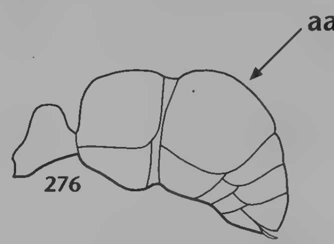


Key to the Genera of the Subfamily Ponerinae

1. Upper plate of the second segment of the gaster (second gastral tergite) strongly arched so that it forms the rearmost part of the gaster when viewed from the side, the remaining segments being pushed forwards underneath the first segment of the gaster (Fig. 275a) 2

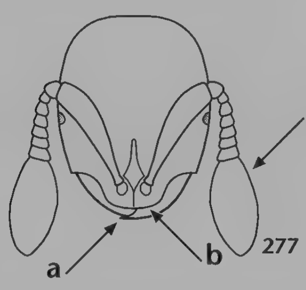
   Upper plate of the second segment of the gaster (second gastral tergite) only weakly arched and located in the middle of the gaster, the rearmost part of the gaster pointing rearwards or directly down (Fig. 276aa) 3

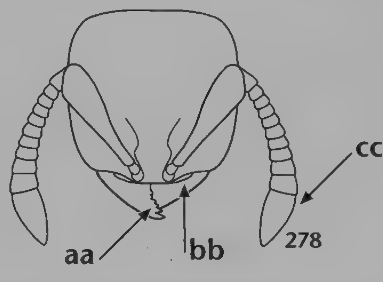




2. Mandibles with only a single tooth at the tip (Fig. 277a). Clypeus extending forwards so that it overhangs the rear part of the mandibles when they are closed (Fig. 277b). Antennae with ten or fewer segments (including the scape) and with the last (apical) segment greatly enlarged and about as long as the remaining segments combined (excluding the scape) (Fig. 277c) .... *Discothyrea*

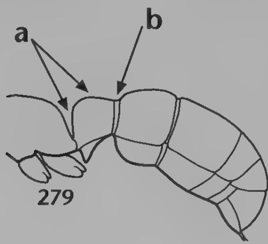
   Mandibles with three or more teeth (Fig. 278aa). Clypeus not extending forwards and with the rear part of the mandibles visible when they are closed (Fig. 278bb). Antennae with 12 segments (including the scape) and with the last (apical) segment moderately enlarged but distinctly shorter than the remaining segments combined (excluding the scape) (Fig. 278cc) .... *Proceratium*

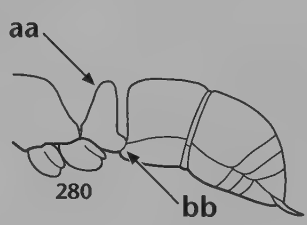




3. Petiole with distinct front and top faces (Fig. 279a) but without a separate rear face, the rear section of the petiole attached to the gaster by its entire height and with the upper surfaces of the petiole and gaster separated by at most a shallow impression (Fig. 279b) 4

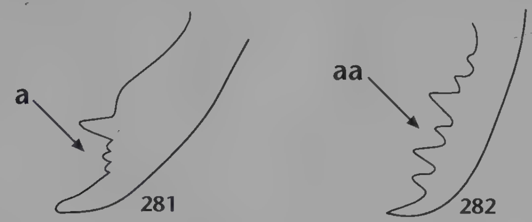
   Petiole with distinct front, top and rear faces (Fig. 280aa), its attachment to the gaster narrow, slender and involving only the lower surface of the petiole, and with the petiole and gaster separated by a distinct impression (Fig. 280bb) 8





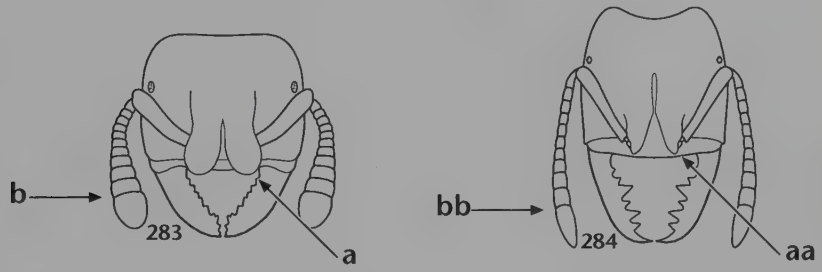
4. Mandibles long, slender and with the teeth (usually three, sometimes with a few very small denticles as well) grouped together near the tip on a face separate from the rest of the mandible (Fig. 281a) . . . . *Prionopelta*

Mandibles long, slender and with five or more teeth that are found along the entire inner surface (Fig. 282aa) 5



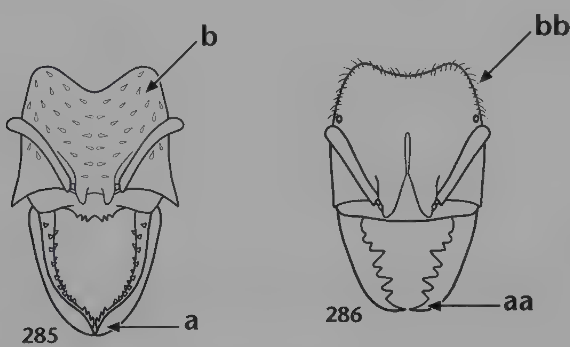
5. Frontal lobes large and extending well forward of the antennal sockets so that when viewed from the front they cover the underlying clypeus and often form the front margin of the head (Fig. 283a). Antennae with the last few segments distinctly flattened in cross-section (Fig. 283b) . . . .*Myopopone*

Frontal lobes extending only slightly forward of the antennal sockets and not covering the clypeus when viewed from the front (Fig. 284aa). Antennae with the last few segments approximately round in cross-section (Fig. 284bb) 6



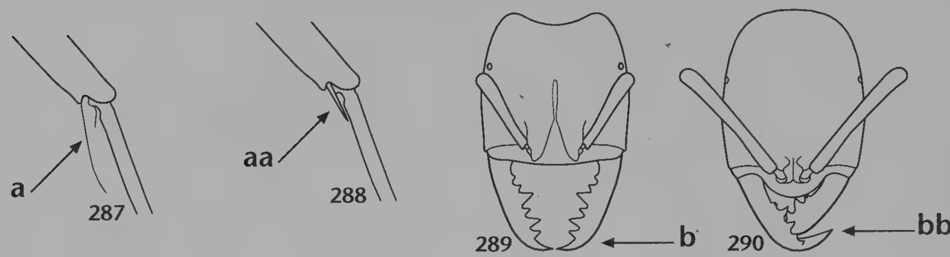
6. Tips of the mandibles rounded and with very short, blunt teeth (Fig. 285a). Hairs (setae) on head and body broad and rounded (spatulate) (Fig. 285b) . . . .*Mystrium*

Tips of the mandibles with a single distinct, sharp tooth (Fig. 286aa). Hairs (setae) on head and body long, thin and tapering to points (Fig. 286bb) .7



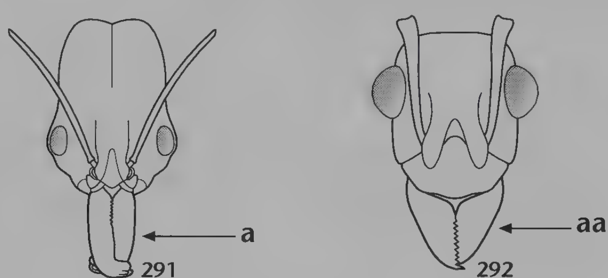
7. Tibiae of the hind legs with large comb-like (pectinate) spurs (Fig. 287a). Tooth at the tip of the mandibles no more than twice as long as the next longest tooth (Fig. 289b) . . . .*Amblyopone*

Tibiae of the hind legs usually without spurs, but if present they are small, straight and smooth (not pectinate) (Fig. 288aa). Tooth at the tip of the mandibles at least four times longer than the next longest tooth (Fig. 290bb) . . . .*Onychomyrmex*



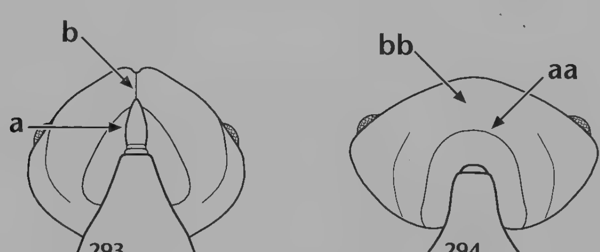
8. Mandibles long and straight, inserted in the middle of the front margin of the head, and with only two or three large teeth near the tips (Fig. 291a) (sometimes with small denticles along their inner margins, but these are much smaller than the teeth at the tips) 9

Mandibles long and straight or triangular, inserted at the sides (lateral corners) of the head, and with the teeth either located along the entire inner margin (Fig. 292aa) or lacking 10



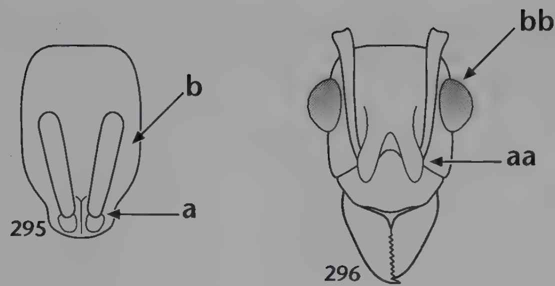
9. Top of the head with dark, V-shaped lines (Fig. 293a) that converge to form a distinct, sometimes shallow groove on the upper front of the head (Fig. 293b) . . .*Odontomachus*

Top of the head without dark lines and with a broad, uninterrupted, curved ridge (Fig. 294aa). Upper front of the head usually smooth (Fig. 294bb) or with at most a weak, ill-defined groove . . . .*Anochetus*



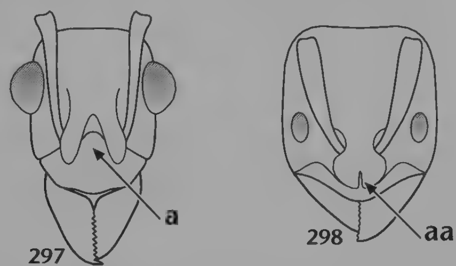
10. Frontal lobes reduced to a narrow, sharp ridge between the antennal sockets and with the antennal insertions clearly visible when viewed from the front (Fig. 295a). Eyes absent (Fig. 295b) . . . .*Probolomyrmex*

Frontal lobes distinct and expanded towards the sides so they cover and hide at least the inner part of the antennal sockets (Fig. 296aa). Eyes generally large and distinct (Fig. 296bb) but rarely absent 11



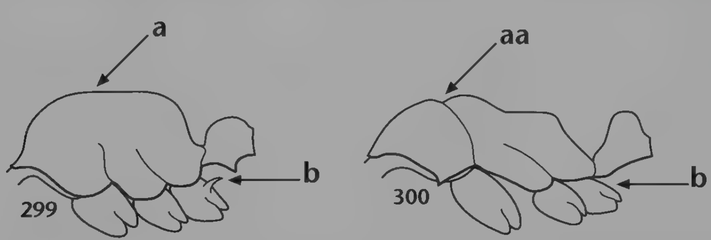
11. Forward sections of the frontal lobes and the antennal sockets widely separated by the broadly rounded or triangular rear section of the clypeus which extends between them (Fig. 297a) 12

Forward sections of the frontal lobes and the antennal sockets very close together and at most separated by a very narrow triangle of the clypeus which extends rearwards between them (Fig. 298aa) (sometimes the clypeus does not extend back between the frontal lobes and they are touching throughout their length) 15



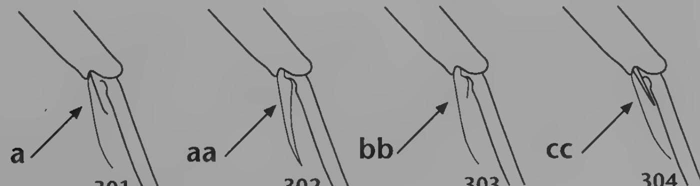
12. When viewed from above, the pronotum and mesonotum form a single, uninterrupted plate (Fig. 299a). First segment (coxa) of the hind leg with a tooth or spine on its upper surface near the body (Fig. 299b) ....*Gnamptogenys*

When viewed from above, the pronotum and mesonotum are separated by a distinct suture so that each forms a separate plate (Fig. 300aa). First segment (coxa) of the hind leg smooth on its upper surface and without a tooth or spine near the body (Fig. 300bb) 13



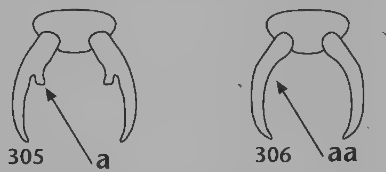
13. Tibiae of the hind legs each with two comb-like (pectinate) spurs, one large and one small (Fig. 301a) (note that the teeth on the small spur can be difficult to see) . . .*Platythyrea*

Tibiae of the hind legs each with a single simple (Fig. 302aa) or comb-like (pectinate) (Fig. 303bb) spur, or with two spurs, one large and comb-like (pectinate) behind a small and simple one (Fig. 304cc) 14



14. Claws on the hind legs with a tooth at about the middle of their inner surface (Fig. 305a) . . . . *Rhytidoponera*

Claws on the hind legs simple, without a tooth on their inner surface (Fig. 306aa) . . . . *Heteroponera*

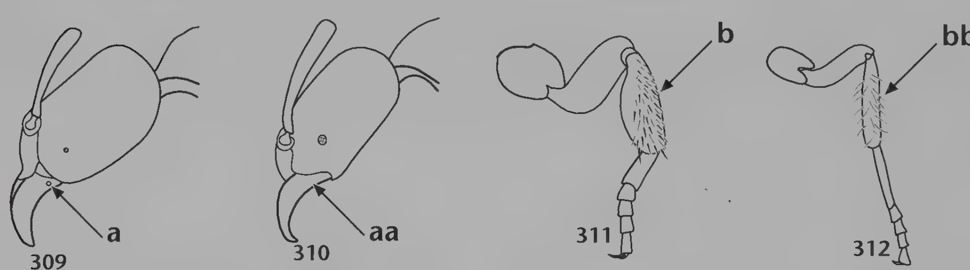


15. Tibiae of the hind legs each with a single large, comb-like (pectinate) spur (Fig. 307a) . . 16

Tibiae of the hind legs each with two spurs, a large and comb-like (pectinate) behind a much smaller simple one (Fig. 308aa) 19

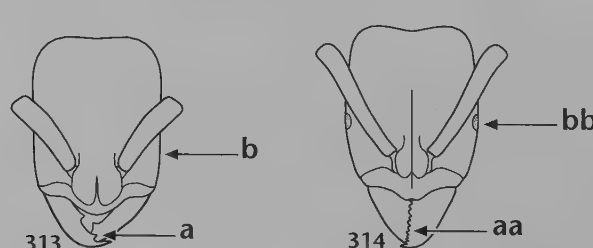
16. Side of the mandible near its insertion into the head with a small oval or round depression or pit (Fig. 309a). Outer surfaces of the tibiae of the middle legs usually with a mixture of thickened peg-like setae or narrow spines and normal, thinner hairs (Fig. 311b) . . . . *Cryptopone*

Side of the mandible near its insertion into the head smooth or with weak ridges (Fig. 310aa). Outer surfaces of the tibiae of the middle legs with all hairs thin and uniform in diameter (although they may differ in length) (Fig. 312bb) or lacking hairs altogether 17

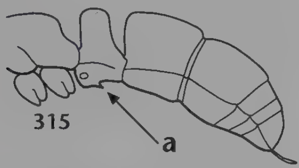


17. Mandibles thin and with widely spaced teeth (Fig. 313a). Eyes absent, although in some individuals small dimples or slight discolorations are present where the eyes would be expected (Fig. 313b) . . . . **Unnamed Genus #3**

Mandibles triangular and with closely spaced teeth (Fig. 314aa). Eyes distinct although sometimes reduced to as few as ten facets (ommatidia) (Fig. 314bb) 18



18. Lower surface of the petiole (subpetiolar process) with a sharp angle to the rear and a translucent thin spot towards the front when viewed from the side (Fig. 315a) . . . . *Ponera*
Lower surface of the petiole (subpetiolar process) a simple, rounded lobe when viewed from the side (Fig. 316aa) . . . . *Hypoponera*



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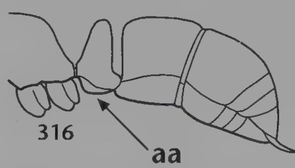
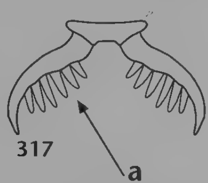


316

19. Claws on the hind legs usually with a series of small teeth on their inner surface (pectinate) (Fig. 317a), but always with at least one tooth present . . . . *Leptogenys*
Claws on the hind legs simple, without teeth on their inner surface (Fig. 318aa) 20



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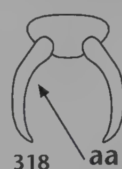
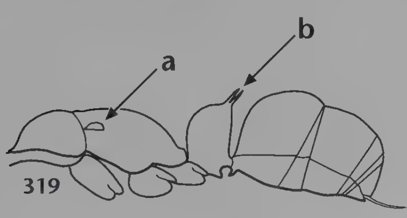


318

20. Side of the mesosoma with a conspicuous pocket-like pit just below its upper surface (Fig. 319a). Petiole with a pair of spines on its upper surface (Fig. 319b) . . . . *Diacamma*
Side of the mesosoma smooth or with ridges, but never with a pocket-like pit (Fig. 320aa). Petiole usually rounded above (Fig. 321bb) but sometimes with a series of small teeth along its rear margin 21



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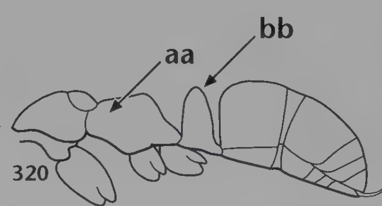
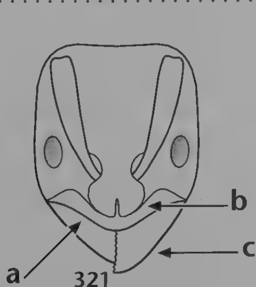


320

21. With the head viewed from the front, the clypeus extends across the entire width of the head in the form of a broadly rounded or angular plate (Fig. 321a), and the frontal lobes and antennal sockets are well behind the front margin (Fig. 321b). Mandibles triangular and touching the front of the clypeus when closed (Fig. 321c) . . . . *Pachycondyla*
With the head viewed from the front, the clypeus forms a central projection that extends well forward of the regions to either side (Fig. 322aa), and the frontal lobes and antennal sockets are very near the front margin (Fig. 322bb). Mandibles almost always long and slender (in one species they are expanded and nearly triangular) and always leaving a gap between them and the front of the clypeus when closed (Fig. 322cc) . . . . *Myopias*



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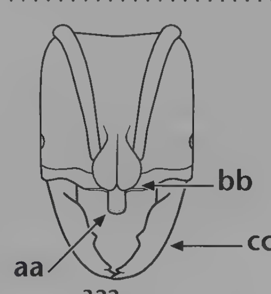


322

Identification

The compound eyes are absent (Figs 39aa, 323). The antennae are ten-segmented. The mesosoma is attached to the gaster by two distinct segments, the petiole and postpetiole (Fig. 324). The frontal lobes are always absent so that the antennal sockets are completely visible when viewed from the front (Figs 39bb, 323). The overall size is small and ranges from about 2.5 mm to 4.0 mm long.

Overview

The subfamily Aenictinae contains a single genus (*Aenictus*) with 140 described species and subspecies. They occur throughout Africa and east to China and Australia, with single species known from Greece and Armenia. All known species are 'army ants', that is, they forage using large raiding columns and have a nomadic life style. For additional details, see below under Biology.

Aenictus

Identification

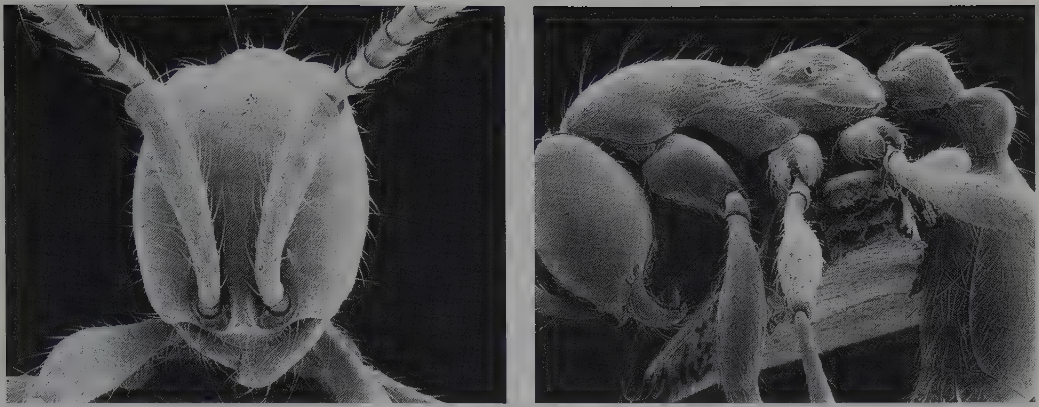
Workers of *Aenictus* are recognised by their moderately small size (less than about 4 mm), lack of eyes, long slender bodies and long legs. At first sight they are similar to some myrmicines (ants of the subfamily Myrmicinae) but differ in lacking the frontal lobes and having the antennal sockets completely visible when viewed from the front (Figs 39bb, 323) (myrmicines have frontal lobes that are expanded towards the sides of the head and partly cover the antennal sockets (Fig. 38b)). Some of the smaller, paler species are also similar to *Leptanilla* workers (Figs 451, 452), but differ in being larger and having only ten segments in the antennae.

Often males of *Aenictus* are more frequently encountered than workers because they are attracted to lights. These males can be separated from those of other ants by the exposed antennal sockets, lack of a postpetiole and the smooth gaster which lacks a constriction between the first and second segments.

Biology

The most notable aspect of *Aenictus* is that they are 'army ants'. That is, they conduct raids using large numbers of workers, primarily attacking other ants, social wasps and termites, but also other arthropods. These raids occur both day and night, usually across the ground surface but occasionally also arboreally. During raids, many workers attack a single nest or small area, with several workers coordinating their efforts to carry large food items back to the nest or bivouac. They also have a nomadic life style, alternating between a migratory phase in which nests are temporary bivouacs in sheltered places above the ground and the stationary phase when semi-permanent underground nests are formed. During the nomadic phase bivouacs move regularly and can move more than once a day when larvae require large amounts of food. Individual nests usually contain up to several thousand workers, although nest fragments containing only a few hundred workers are often encountered. Queens are highly specialised and look less like workers than in most ant species. They have greatly enlarged gasters and are termed dichthadiform. New colonies are formed by the division of existing nests rather than by individual queens as in most ant species.

Aenictus is represented in Australia by four described species, three of which also occur outside Australia. The relationship of *Aenictus* to other ants has been investigated by Bolton (1990) while the species-level taxonomy was last examined by Wilson (1964).



Figs 323, 324.
Aenictus worker from Telegraph Line crossing Jardine River, Queensland (head 0.78 mm wide).

Distribution and Habitats

Aenictus in Australia is most commonly encountered in two regions: along the east coast from the tip of Cape York Peninsula south to north-eastern New South Wales, and in the Top End and northern Kimberley region (Fig. 325). In addition, males have been collected near Alice Springs and B.B. Lowery (personal communication) reports encountering the genus at Fowlers Gap, New South Wales, and Alice Springs, Northern Territory. These last two collections are especially interesting as they are well outside the main range of the genus. Collections have come from rainforests as well as dry, rocky sclerophyll woodlands.

Fig. 325.
Collection sites for *Aenictus* specimens.

List of Australian Species

aratus Forel
ceylonicus (Mayr) (= *turneri* Forel, *deuqueti* Crawley, *exiguus* Clark)
hilli Clark
philiporum Wilson

Identification

The frontal lobes are reduced so that the antennal sockets are completely visible when viewed from the front (Fig. 326). The petiole is composed of a single segment and the gaster has a distinct constriction between the first and second segments (and sometimes between the remaining segments as well) (Fig. 327). A row of small spines or peg-like teeth (pygidial teeth) are present on the upper surface of the gaster near the tip (Fig. 25a).

The spines or pegs at the tip of the gaster are always present and will separate these ants from all others. However, in many species the spines are short and can be partly hidden by much longer, thinner hairs that are also present at the tip of the gaster. A close inspection from the side of the gaster may be required to see these small spines in some species.

Overview

The 198 species of Cerapachyinae are placed in five genera, two of which occur in Australia. Species are known from throughout the world in tropical and subtropical areas. They are noteworthy in that workers are specialist predators of other ants. See under Biology below for additional details.

Cerapachys

Identification

Within the Cerapachyinae, *Cerapachys* can be separated from *Sphinctomyrmex* (the only other genus of the subfamily known from Australia) by the shape of the gaster. In *Cerapachys*, the joints between the last four segments of the gaster are smooth so that in profile their upper surfaces form a smooth outline (Figs 46a, 327). In *Sphinctomyrmex*, these segments are separated from each other by distinct constrictions so that in profile the outline is a series of convexities (Figs 47aa, 330).

Most species of Australian *Cerapachys* have elongate, cylindrical bodies that are red or black (or less commonly yellow) and shiny. For protection during raids, species of *Cerapachys* have developed a relatively heavy integument with numerous sharp angles and teeth. Some species also have a ridge along the side of the petiole and often the mesosoma as well. The compound eyes can be large, small or absent.

Species of *Cerapachys* are most often confused with ponerines (ants of the subfamily Ponerinae) but differ in the details mentioned above as well as having the frontal lobes very narrow so that the antennal sockets are completely visible when viewed from the front.

Biology

Species of *Cerapachys* are specialist predators of other ants. They hunt during the day in long files over the ground surface (or occasionally into trees) with many workers moving rapidly together in a loose column. In some cases, they will use scouts to find a suitable nest to raid, these initial scouts then return to their home nest to recruit additional workers for a full-fledged raid. Chemical trails are laid during raids which are used by workers returning to the nest with prey, either singly or in small groups.

During raids, larvae in the attacked nest are stung and paralysed but not killed. They are then taken back to the host nest where they can survive in this paralysed state for an extended period without increasing in size or pupating. Workers, queens and larvae of *Cerapachys* all feed on the prey larvae, and this food source can be used during extended periods of non-foraging. For additional details on the biology of these ants, see Briese and Macauley (1981), Brown (1975) and Hölldobler (1982).

Workers of *Cerapachys* are often encountered as individual scouts, small groups or huge columns on the surface of the ground during the day as they conduct raids. Nests occur in a wide range of sites, most commonly directly in the soil with single, small, simple entrance holes; in cracks or between slabs of rock; in rotten wood on or in the ground. Less commonly they nest in hollow twigs and beetle burrows. Colonies are fairly small, normally with several hundred workers or less. Most species will disperse quickly when disturbed but some of the smaller species will lie motionless.

Cerapachys is very diverse in Australia with 44 described species. For a discussion of their taxonomy and biology, see Brown (1975).

Figs 326, 327.
Cerapachys edentatus (Forel) worker from Bringelly, New South Wales (head 0.54 mm wide).

Distribution and Habitats

The 139 known species of *Cerapachys* occur in the tropics and subtropics of the world. In the Australian region they occur throughout Australia (Fig. 328) and in New Guinea, New Caledonia, Solomon Islands and Fiji. Within Australia, the 44 species of *Cerapachys* can be encountered in all major habitats although they are much less common in wet, cool sites.

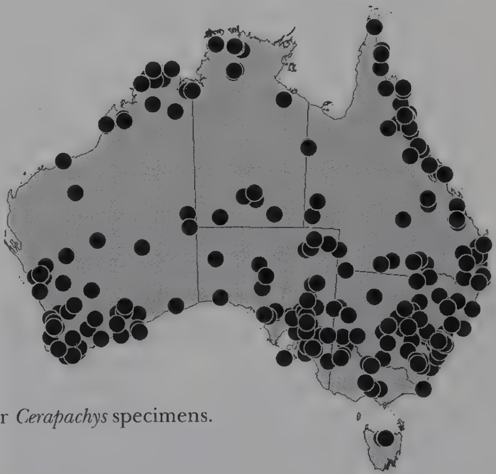


Fig. 328.
Collection sites for *Cerapachys* specimens.

List of Australian Species

aberrans (Clark)
adamus Forel
angustatus (Clark)
aranus Bolton (= *emeryi* Viehmeyer)
bicolor (Clark)
binodis Forel
brevicollis (Clark)
brevis (Clark)
clarki (Crawley) (= *castaneus* Clark)
constrictus (Clark)
crassus (Clark)
edentatus (Forel) (= *australis* Forel)

elegans (Wheeler)
fervidus (Wheeler) (= *dromus* Clark, *fici* Viehmeyer, *flavescens* Clark, *leae* Wheeler, *newmani* Clark, *scrutator* Wheeler)
ficosus (Wheeler)
flammeus (Clark)
gilesi (Clark)
grandis (Clark)
greavesi (Clark)
gwynethae (Clark)
heros (Wheeler)
incontentus Brown (= *inconspicuus* Clark)
jovis Forel
larvatus (Wheeler)
latus Brown (= *reticulatus* Clark)
longitarsus (Mayr) (= *longitarsus australis* Forel, *pygmaeus* Clark)
macrops (Clark)
mjobergi Forel
mullewanus (Wheeler)
nigriventris (Clark)
picipes (Clark)
pictus (Clark)
piliventris (Clark
potteri (Clark)
princeps (Clark) (= *clarus* Clark)
punctatissimus (Clark)
ruficornis (Clark)
rugulinodis (Wheeler)
senescens (Wheeler)
simmonsae (Clark)
singularis Forel (= *singularis rotula* Forel)
sjostedti Forel
turneri Forel
varians (Clark)

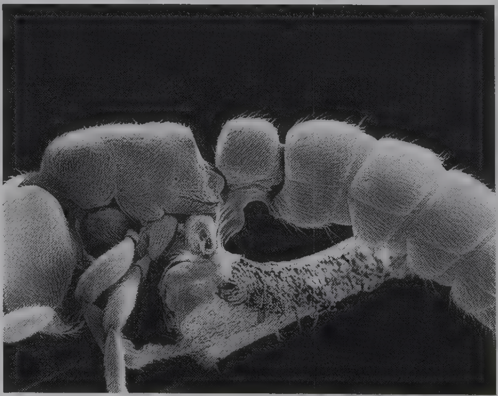
Sphinctomyrmex

Identification

As mentioned above, *Sphinctomyrmex* can be separated from *Cerapachys* (the only other genus of the subfamily known from Australia) by the shape of the gaster (compare Figs 46a and 327 with Figs 47aa and 330). Its shape is unique to *Sphinctomyrmex* and should allow ready identification of members of this genus.

Biology

As in *Cerapachys*, species of *Sphinctomyrmex* are specialist predators of other ants. They forage primarily below ground and rarely come to the surface. Most species lack fully winged queens and have, instead, worker-like (ergatoid) queens. Workers have a relatively heavy integument with angles and teeth for protection during raids. Nests are in soil and under stones and contain several hundred workers and up to 20 or more ergatoid queens. For additional information on the taxonomy and biology of these ants, see Brown (1975) and Briese (1984).

Figs 329, 330.
Sphinctomyrmex worker from 2 miles E of Berry, New South Wales (head 0.90 mm wide).

Distribution and Habitats

Species of *Sphinctomyrmex* are known from tropical regions throughout the world. Australia is especially rich in having 15 of the 22 described species. Australia is also the only continent where *Sphinctomyrmex* extends into temperate areas such as the higher reaches of the Great Dividing Range in New South Wales and Victoria, as well as Tasmania (Fig. 331). The specimens (including males collected at a light) from the Kimberley region are of special note as they are significantly outside the main range of the genus. They are found in dry to wet sclerophyll woodlands.

Fig. 331.
Collection sites for *Sphinctomyrmex* specimens.

List of Australian Species

asper Brown
cedaris Forel
clarus (Forel)
duchaussoyi (André) (= *hackeri* Wheeler)
emeryi (Forel) (= *perstictus* Brown)
froggatti Forel
imbecilis Forel (= *brunnicornis* Clark, *fulvidus* Clark, *manni* Wheeler, *silaceus* Clark)
mjobergi Forel
myops Forel
nigricans (Clark)
occidentalis (Clark)
septentrionalis (Crawley)
steinheili Forel (= *fallax* Forel, *fallax hedwigae* Forel, *fulvipes* Clark, *hirsutus* Clark)
trux Brown
turneri Forel

Identification

The mesosoma is attached to the gaster by a single distinct segment, the petiole (Fig. 19a). The gaster is smooth, without constrictions between the segments (Fig. 19a). The sting is absent and the tip of the gaster is slit-like and without a circular opening (an acidopore) (Figs 33aa, 34aa).

Species of Dolichoderinae are most often confused with species of the subfamily Formicinae because both have a single segmented petiole, lack a sting and are often similar in overall body size and shape This is especially true for the smaller species such as those in *Doleromyrma* and *Tapinoma.* However, dolichoderines can always be separated from formicines because the tip of the gaster has a slit-like opening (Figs 33aa, 34aa) while all formicines have a small circular opening (Figs 31a, 32a).

Overview

This subfamily contains some of the most common and well-known species of Australian ants. This includes the meat ants (in the genus *Iridomyrmex*), a group found throughout Australia (except Tasmania), often in very large numbers. Some of the rarer Australian ants are also in this subfamily. For example, *Turneria bidentata* has been collected fewer than 15 times. A significant introduced pest, the Argentine ant (*Linepithema humile*), is also a dolichoderine.

Most species of Dolichoderinae are general predators or scavengers. Many also tend insects in the order Hemiptera to collect honeydew or are associated with caterpillars. Nests are found in a wide variety of locations, including in the soil, under rocks and other objects, in rotten and living wood, in termite mounds, and in cracks between rocks. Some species (in the genus *Bothriomyrmex*) are thought to establish their nests by new queens invading the nests of other ants, killing the queen, and using the captured workers to help raise her own offspring.

Species of Dolichoderinae can be found in most regions of the world and in all major habitats. There are about 1000 described species and subspecies placed in 22 genera worldwide. Fourteen genera and 160 species and subspecies have been described from Australia, with numerous taxa still awaiting description. Two of the genera, *Doleromyrma* and *Froggattella,* are only known from Australia.

ANONYCHOMYRMA

Identification

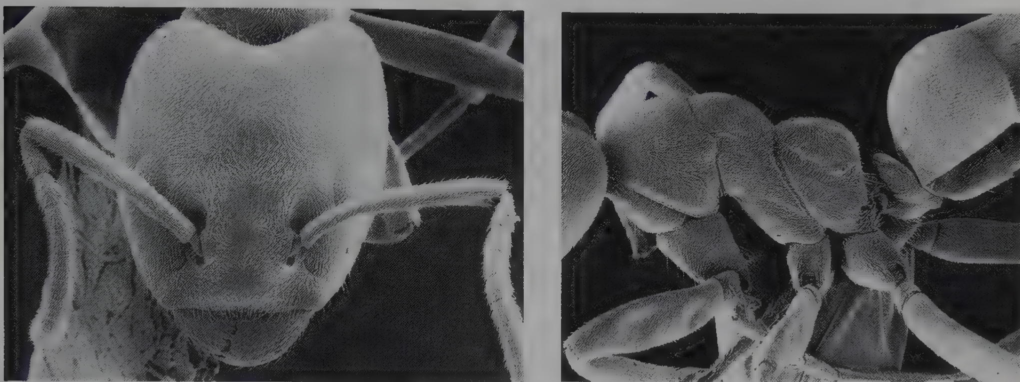
The front margin of the clypeus (just above the mandibles) is flat or convex (Figs 96aa, 332). The scapes are about as long as the head (Fig. 49aa). The first (apical) tooth of the mandible is only slightly longer than the second (subapical) tooth (Fig. 106cc). The eyes are larger in diameter than the maximum diameter of the scape and are located relatively downward on the head near the mandibles (Fig. 104dd). The petiole is upright and at most only moderately inclined forward (Fig. 333).

In addition to the characters listed above, *Anonychomyrma* workers can be recognised by their usually square or slightly heart-shaped heads (Fig. 332) and compact bodies with domed pronotum, mesonotum and propodeum (Fig. 333). Many species also produce a distinct odour that is often noticeable for quite a distance.

Biology

Species of *Anonychomyrma* nest either in the ground with or without coverings, or arboreally in living or dead wood. They forage in conspicuous trails on the ground and on tree trunks. Although not studied in detail, they seem to be general predators and also collect plant juices.

Some species are associated with the caterpillars of selected butterflies. Nest sizes are moderate to large, ranging from 500 to tens of thousands of workers. When disturbed, most species elevate their gasters and release strong, acrid smelling chemicals as a defensive measure.



Figs 332, 333.
Anonychomyrma worker from 12 km E of Warburton, Victoria (head 1.02 mm wide).

Distribution and Habitats

Most species of *Anonychomyrma* occur in New Guinea, the Solomon Islands and Australia, with a single species known from Malaysia, Sulawesi and Sumatra. There are currently 30 described species and subspecies in the genus. An additional two species are known from fossil records.

Within Australia, the 14 described species and subspecies are limited to a narrow band along the east coast from Cape York Peninsula south to Kangaroo Island, South Australia, as well as Tasmania and the coastal region of southern Western Australia (Fig. 334). They frequent a range of habitats but show a preference for wooded areas, being most common in moist to semi-arid woodlands and rainforests.

Fig. 334.
Collection sites for *Anonychomyrma* specimens.

List of Australian Species and Subspecies

arcadia (Forel)
biconvexa (Santschi) (= *foetans* Clark)
fornicata (Emery)
froggatti (Forel)
gilberti (Forel)
itinerans (Lowne)
itinerans ballaratensis (Forel)
itinerans depilis (Forel)
itinerans perthensis (Forel)
longiceps (Forel)
malandana (Forel)
nitidiceps (André)
procidua (Erichson)
purpurescens (Lowne)

Bothriomyrmex

Identification

The palps are short, do not reach the underside of the head beyond the mouthparts, and have a formula of 2:2 (both the inner and outer palps with two segments) (Fig. 68a). The compound eyes are small, with between 10 and about 40 facets (ommatidia) and with a maximum diameter which is less than the maximum diameter of the scape (Figs 71c, 335). The front margin of the clypeus above the mandibles with from 2 to about 12 downwardly curved hairs which are about the same length as or slightly shorter than the closed mandibles (Figs 73d, 335).

Workers of *Bothriomyrmex* are similar in overall size and body shape to those of *Acropyga*, *Doleromyrma*, *Plagiolepis*, *Tapinoma* and *Technomyrmex*. They may be separated from *Acropyga* and *Plagiolepis* by their lack of an acidopore at the tip of the gaster, and from the remaining genera by their smaller compound eyes and short palps.

Biology

Nests occur in soil with or without covering, in old termite nests, or in rotten wood. Workers are commonly found foraging on trees. Although no Australian species has yet been examined in detail, species from outside Australia are known to establish new nests by invading established nests of *Tapinoma* (Santschi 1906) and *Iridomyrmex* (Donisthorpe 1944), that is, they are temporary social parasites. During nest founding, a *Bothriomyrmex* queen will enter the nest of another ant species and kill its queen. The *Bothriomyrmex* queen will then lay eggs which are tended and raised by the host ants as if they were laid by their own queen. As a result of this, the nest will contain workers of both *Bothriomyrmex* and its host for a time after it is invaded, but eventually the host workers will die and the nest will contain only *Bothriomyrmex* workers. This nest will then grow and produce new queens and males, and the cycle will repeat with another nest being invaded by a new *Bothriomyrmex* queen.

Figs 335, 336.
Bothriomyrmex worker from Salt Lake track, Little Desert National Park, Victoria (head 0.51 mm wide).

Distribution and Habitats

The 45 described species and subspecies of *Bothriomyrmex* occur from Europe and northern Africa east through India to Taiwan, the Solomon Islands and Australia. In Australia, *Bothriomyrmex* is widespread although most collections are from the southern areas of New South Wales, Victoria, Tasmania, South Australia and Western Australia (Fig. 337). In this southern region they are found in a wide variety of habitats, including grasslands, dry sclerophyll woodlands, mallee and, less commonly, rainforests. Collections from northern areas are few and scattered and the genus is most commonly encountered in moist sites such as riparian areas and rainforest patches.

List of Australian Species and Subspecies

flavus Crawley
pusillus (Mayr)
pusillus aequalis Forel
scissor Crawley
wilsoni Clark

Fig. 337.
Collection sites for *Bothriomyrmex* specimens.

DOLEROMYRMA

Identification

The front margin of the clypeus above the mandibles has downwardly curved hairs which are about one-half the length of the closed mandibles (Fig. 101a). The mandibles have four or five large teeth and four or five small denticles, and a moderately distinct angle between the surface containing the teeth and the surface near the clypeus (basal angle present) (basal angle as in Fig. 58cc). The upper face of the propodeum is shorter than the rear face (Figs 101b, 339). The petiole is strongly inclined forwards but is angular above and the forward and rear faces are present and distinct (Figs 101, 339). The first segment of the gaster projects forward and partially conceals the petiole when viewed from above.

Species of *Doleromyrma* are most often confused with those of *Iridomyrmex*, *Plagiolepis* and *Tapinoma*. They differ from *Iridomyrmex* in having the front margin of the clypeus concave in the centre (similar to Fig. 96aa), rather than having a projection (Fig. 94a). They can be separated from *Plagiolepis* by the lack of an acidopore (present in Figs 31a and 32a, absent in Figs 33aa, 34aa). Separating *Doleromyrma* and *Tapinoma* can be difficult. They are about the same overall size and colour, and their mesosomas are essentially identical. They differ in that the hairs on the front margin of the clypeus (above the mandibles) are downwardly curved in *Doleromyrma* (Fig. 101a) while they are straight in *Tapinoma* (Fig. 102aa). *Doleromyrma* has fewer teeth on the mandibles and the mandibles have a moderately distinct angle between the surface with teeth and the surface near the clypeus (similar to Fig. 58cc) (in *Tapinoma* this region of the mandible is rounded (Fig. 57c)). The petioles also differ, with *Doleromyrma* always having distinct forward and rear faces which are separated by a sharp angle (Figs 101, 339). In *Tapinoma*, the node of the petiole is generally absent as the forward face is greatly reduced and often completely absent (Fig. 54a).

Biology

Doleromyrma, although frequently encountered, has received little attention in the published literature. They occur most commonly in dry forested areas, including coastal scrub or heath, where they nest in soil, under rocks or rotten logs, or occasionally in abandoned nests of other ants. Nests usually contain several hundred workers which disperse quickly into protected areas when disturbed. They are occasionally pests in houses (Nikitin 1979).

Figs 338, 339.
Doleromyrma worker from Porongurup National Park, Western Australia (head 0.55 mm wide).

Distribution and Habitats

Doleromyrma contains a single described species and two subspecies. They are limited to Australia, although they have been recently introduced into New Zealand (Keall and Somerfield 1980). Most collections are from southern and coastal areas of New South Wales, Victoria, Tasmania, South Australia and Western Australia (Fig. 340). *Doleromyrma* has also been collected from a number of sites in inland areas of Queensland, New South Wales, South Australia and Western Australia, as well as near Katherine, Northern Territory.

Fig. 340.
Collection sites for *Doleromyrma* specimens.

List of Australian Species and Subspecies

darwiniana (Forel)
darwiniana fida (Forel)
darwiniana leae (Forel)

Dolichoderus

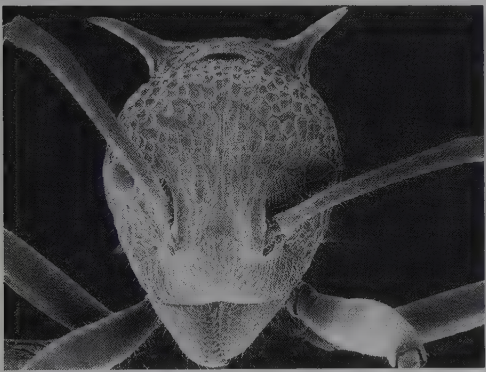
Identification

The underside of the head near the base of the mandible (anterior hypostoma) has a weak to well-developed flange that is sometimes tooth-like (Fig. 75a). Spines are sometimes present on the pronotum and propodeum (Figs 79, 342), or just the propodeum. If spines are absent from the propodeum, then the rear face of the propodeum is often distinctly concave (Figs 80c, 346), but may be flat (Figs 81d, 344). The body is often strongly sculptured (Figs 341, 342, 345, 346). The plates on the underside of the body above the front legs (visible only when the front legs are removed) are expanded and overlapping along the centre line of the body (Fig. 77b).

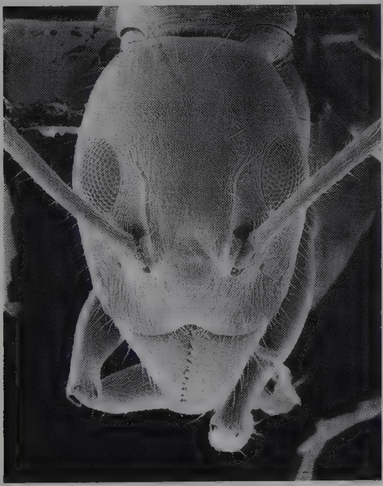
There are four sets of species of *Dolichoderus* in Australia. Two of these (subgenera *Acanthoclinea* and *Diceratoclinea*) have long spines on the pronotum and propodeum (Figs 79, 342) or just the propodeum. These spines do not occur in any other genera of the Dolichoderinae except *Froggattella.* In another set, the rear face of the propodeum is weakly (Fig. 81d) to strongly concave (Figs 80c, 346). This is similar to species of *Ochetellus,* but *Dolichoderus* differs in being larger (greater than 3 mm in total length) and in having a small flange on the underside of the head (Fig. 75a) as mentioned above. The metanotal groove in *Dolichoderus* is also deeper and broader (compare Figs 80, 81, 344 and 346 with Figs 91 and 361), and in many species the body is more heavily and distinctly sculptured (compare Fig. 342 with Fig. 361). The final group of *Dolichoderus* has the body essentially smooth (Fig. 343) and the rear face of the propodeum flat to weakly convex (Figs 81, 344).

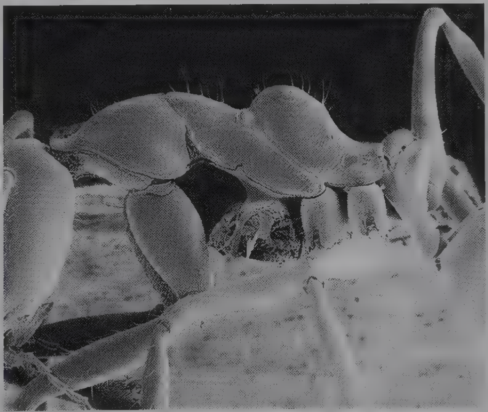
Biology

Species of *Dolichoderus* are regularly encountered although most often in small numbers. They often forage in columns on the ground or on low vegetation and trees. Workers are general scavengers and also tend Hemiptera to collect honeydew. They nest either in the soil or arboreally, and sometimes use plant fibres to form coverings during nest construction. During warm weather, some species will move their larvae to the surface of the ground for warmth. The Australian species were examined by Clark (1930).

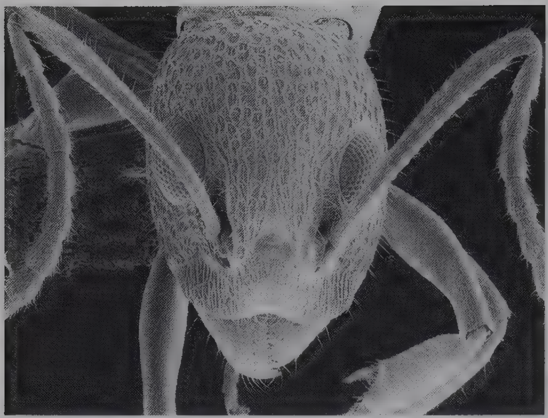


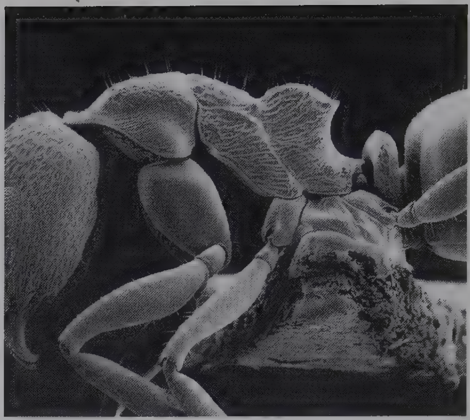
Figs 341, 342.
Dolichoderus (subgenus *Acanthoclinea*) worker from Dawes, 20 miles SE of Biloela, Queensland (head 1.66 mm wide).





Figs 343, 344.
Dolichoderus australis André worker from Blundells Creek, 2 miles N of Mt Aggie, ACT (head 0.89 mm wide).





Figs 345, 346.
Dolichoderus (subgenus *Hypoclinea*) worker from York, Western Australia (head 0.78 mm wide).

Distribution and Habitats

The 142 described species and subspecies of *Dolichoderus* occur in southern North America, northern South America, Europe east to the Black Sea, and from India east to Japan and south to Australia. An additional 30 species are known from fossil records. Within Australia, there are 22 described species and subspecies. These occur in eastern Queensland from Cape York Peninsula south through eastern New South Wales, Victoria, southern South Australia and southern Western Australia (Fig. 347). The only known Tasmanian population is apparently introduced. Species of *Dolichoderus* are found in forested areas, from dry savannah woodlands through mallee, dry sclerophyll and wet sclerophyll, and into rainforests.

Fig. 347.
Collection sites for *Dolichoderus* specimens.

List of Australian Species and Subspecies

angusticornis Clark
armstrongi McAreavey
australis André
clarki Wheeler (= *tristis* Clark)
clusor Forel
dentatus Forel
doriae Emery
extensispinus Forel
formosus Clark
glauerti Wheeler
goudiei Clark
nigricornis Clark
occidentalis Clark
parvus Clark
reflexus Clark
scabridus Roger (= *foveolatus* Lowne)
scabridus ruficornis Santschi
scrobiculatus (Mayr)
turneri Forel
ypsilon Forel
ypsilon niger Crawley
ypsilon rufotibialis Clark

FROGGATTELLA

Identification

Froggattella is immediately recognisable by the unique elongate, flattened, rearward-directed, blunt spines on the propodeum (Figs 64a, 349), and by the location of the propodeal spiracles which are found on the spines near their bases (Fig. 64b). No other group of ants has this combination of features.

Biology

Froggattella is sporadically distributed and not commonly encountered. They generally forage arboreally while nesting either in the soil or arboreally. Workers are most often encountered as they forage in distinct trails on low vegetation or small trees. Their species-level taxonomy has been discussed by Shattuck (1996b).

Figs 348, 349.
Froggattella kirbii (Lowne) worker from 36 miles SE by E of Zanthus, Western Australia (head 0.88 mm wide).

Distribution and Habitats

The two described species of *Froggattella* are limited to Australia. They occur along the east coast from Cape York Peninsula south to Ceduna, South Australia, as well as in southern Western Australia and the Kimberley and Darwin regions (Fig. 350). They show a preference for open woodland sites.

List of Australian Species

kirbii (Lowne) (= *kirbyi bispinosa* Forel, *kirbyi ianthina* Wheeler, *kirbyi laticeps* Wheeler, *kirbyi lutescens* Wheeler, *kirbyi nigripes* Wheeler)

latispina Wheeler

Fig, 350.
Collection sites for *Froggattella* specimens.

Iridomyrmex

Identification

The front margin of the clypeus above the mandibles is highly modified with convex areas towards the sides and a central projection (this central projection varies from strongly to weakly developed) (Figs 94a, 351). The compound eyes are placed relatively high on the head and away from the mandibles (Figs 97a, 351). Most other genera in this subfamily have the front margin of the clypeus weakly convex, straight or weakly concave. Only *Froggattella* and *Philidris* share the central projection with *Iridomyrmex*, but these have the eyes low on the head, nearer to the clypeus (Figs 98aa, 348, 366) and *Froggattella* has the propodeal spiracle higher and on the propodeal spines (Fig. 61a).

Biology

Iridomyrmex is one of the largest and most frequently encountered groups of ants in Australia. They are also one of the most ecologically important groups as they interact strongly with many other invertebrates as well as many plants. *Iridomyrmex* species frequently form large nests which are patrolled by aggressive workers. This can significantly reduce the number of other species which can nest or forage in the area. Sometimes the only species which can co-exist with *Iridomyrmex* are those which forage at different times of the day or differ in size compared with *Iridomyrmex* species, and thus 'escape' interactions with the *Iridomyrmex* workers.

The aggressive actions of *Iridomyrmex* species are not just limited to other species of ants. Individual colonies of the same and closely related meat ants (*Iridomyrmex purpureus* group) form discrete, non-overlapping territories with well-defined boundaries. These boundaries are patrolled regularly and when disputes arise, ritualised fighting can occur. During these fights, large numbers of workers from each colony come together, stand upright on the tips of their legs, and kick each other with their hind legs. These confrontations can go on for hours or even days with little or no mortality among the combatants. Once the boundary dispute has been resolved, the workers return to their nests and little interaction is seen in the former battlefield.

Some *Iridomyrmex* associate closely with the caterpillars of certain butterflies. Many of these caterpillars have special glands that produce secretions which are very attractive to these ants.

A number of invertebrates have taken advantage of the large nests of *Iridomyrmex* by becoming specialist predators on these ants. Some spiders prey largely on *Iridomyrmex* workers, and have even developed the ability to use the ants' communication chemicals to determine which individuals to attack. The ants release a special chemical when injured to alert other ants of potential danger. The spiders detect this chemical and preferentially select these injured workers as potential prey. Some predacious ground beetles establish their burrows in soil near the ants' nests. From the relative safety of their burrows they grab passing ants and kill them, feeding on their body fluids.

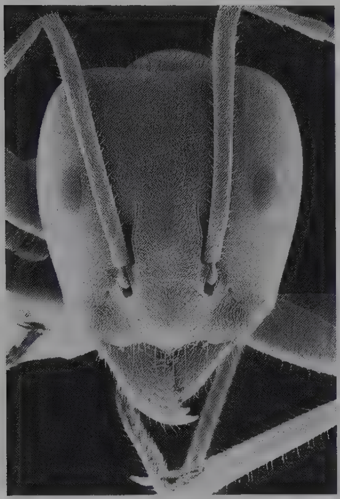
Many plants produce seeds with special food bodies (elaiosomes) that are attractive to ants and other insects. *Iridomyrmex* foragers are often attracted to these seeds and carry them into their nests. Once the food bodies are taken from the seeds, the seeds are discarded. Being in or near the ants' nests provides protection to the young seedlings and may increase the survival of the plants.

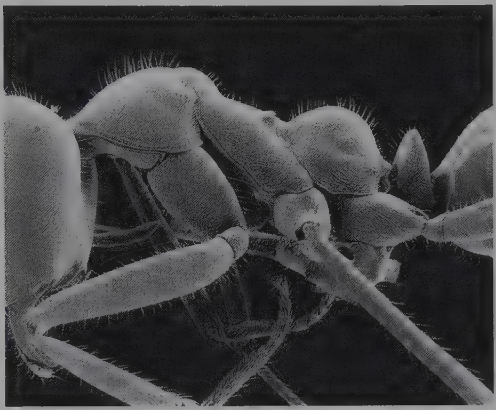
Nests are located in soil, with or without covering, and range in size from a few hundred to over 300,000 workers. The above-ground structure of nests varies from large mounds decorated with small pebbles and having many entrances to single, cryptic holes just large enough for individual workers to squeeze through. Several species in southern Western Australia alternate between two distinct nest types. In the cool winter months they construct above-ground twig nests in open areas, while in the hot summer months they move to below-ground nests in shaded areas. Colonies of meat ants (*Iridomyrmex purpureus* group) are often

spread over wide areas with many individual nests connected by well-defined paths. In some cases these 'super nests' can stretch up to 650 metres.

Most species of *Iridomyrmex* are general scavengers. They may also tend aphids and coccids and will collect nectar when available. Workers of some forage in large, well-defined columns to the same feeding sites for extended periods of time, while others forage singly.

The literature concerning these ants is extensive. A few of the more significant papers include those by Andersen and Patel (1994), Briese and Macauley (1981), Clayton-Greene and Ashton (1990), Ettershank (1971), Ettershank and Ettershank (1982), Greenslade (1974, 1979), Greenslade and Halliday (1982), Moore (1974) and Shattuck (1992a, 1992b, 1993a, 1993b, 1996a).





Figs 351, 352.
Iridomyrmex purpureus (Smith) worker from Oraparinna, Flinders Ranges, South Australia (head 2.03 mm wide).

Distribution and Habitats

The 79 described species and subspecies of *Iridomyrmex* are distributed from India east to China and south to Australia and New Caledonia. An additional seven species are known from fossil records. Within Australia, 63 species and subspecies are described. They occur in all areas (Fig. 353) and all major habitats, often in large numbers and with many species at any given site.

Fig. 353.
Distribution of *Iridomyrmex*.

List of Australian Species and Subspecies

agilis Forel
albitarsus Wheeler
anceps (Roger) (= *excisus* Mayr, *gracilis papuanus* Emery, *discoidalis* Donisthorpe)

anderseni Shattuck
anteroinclinus Shattuck
argutus Shattuck
bicknelli Emery
bicknelli azureus Viehmeyer
bicknelli brunneus Forel
bicknelli luteus Forel
bicknelli splendidus Forel
bigi Shattuck
cappoinclinus Shattuck
cephaloinclinus Shattuck
chasei Forel
chasei concolor Forel
chasei yalgooensis Forel
conifer Forel
cyaneus Wheeler
discors Forel (= *discors occipitalis* Forel, *discors aeneogaster* Wheeler)
dromus Clark
emeryi Crawley
exsanguis Forel
galbanus Shattuck
gracilis (Lowne)
gracilis fusciventris Forel
gracilis mayri Forel
gracilis minor Forel
gracilis rubriceps Forel
gracilis spurcus Wheeler
greensladei Shattuck
hartmeyeri Forel
hesperus Shattuck
innocens Forel
lividus Shattuck
mattiroloi Emery
mattiroloi continentis Forel
mattiroloi parcens Forel
mattiroloi splendens Forel
mimulus Shattuck
mjobergi Forel
notialis Shattuck
obscurior Forel
obscurus Crawley
occiduus Shattuck
prismatis Shattuck
purpureus (Smith) (= *aeneum* Mayr, *detecta* Smith, *detectus castrae* Viehmeyer, *horni* Kirby, *smithii* Lowne)
reburrus Shattuck
rufoinclinus Shattuck
rufoniger (Lowne) (= *mamillata* Lowne)
rufoniger domesticus Forel
rufoniger incertus Forel
rufoniger pallidus Forel
rufoniger septentrionalis Forel
rufoniger suchieri Forel
rufoniger victorianus Forel
sanguineus Forel
spadius Shattuck
spodipilus Shattuck
variscapus Shattuck
vicinus Clark
viridiaeneus Viehmeyer
viridigaster Clark

Leptomyrmex

Identification

The antennal scapes are elongate and surpass the rear margin of the head by more than one-half their length (Fig. 48a). The central area on the underside of the head near the mandibles has a U-shaped notch (medial hypostoma notched) (Fig. 50b). The mandibles have 7–15 large teeth and 5–12 small denticles (Fig. 354).

Species of *Leptomyrmex* are some of the most distinct in the subfamily Dolichoderinae. Most are morphologically similar, being relatively large with elongate legs and distinctive black, orange, or bicoloured black and orange coloration. However, several species (as yet undescribed) are much smaller and superficially resemble *Iridomyrmex*. These small *Leptomyrmex* can be recognised by using the same characters as used for the larger species.

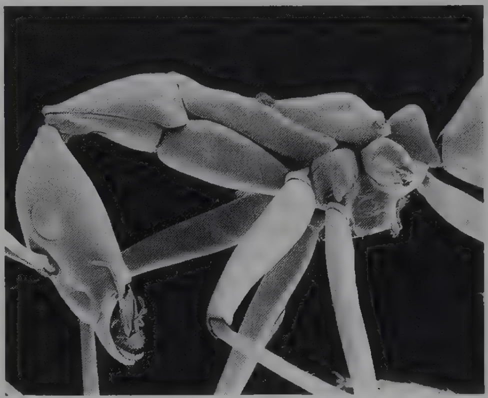
Biology

These conspicuous ants are most often encountered individually or as small groups of two or three foragers on the surface of the ground, and can be found at any time of the day or night. Because of their long legs and thin bodies, they superficially resemble spiders. This is especially true when they are disturbed, as they extend their legs, raise their gasters, and run quickly to escape danger. This has led to their being given the common name 'spider ants'.

When a large source of food is found, they will return to their nest and recruit additional workers to help utilise the newly found resource. They also use workers as 'living storage vessels'. These special workers, called repletes, remain in the nest, accepting liquids from foragers when available and distributing them to all in the nest in times of short supply. To accomplish this, returning foragers transfer their liquid foods to selected workers in the nest. These special workers continue to accept liquids until their gasters become greatly enlarged and extended. When enlarged, repletes cannot escape the nest and remain inside, suspended from the ceiling. They can retain these fluids for extended periods and dispense it on demand.

Nests of *Leptomyrmex* are found in soil or in dead wood, either standing or on the ground, and are often at the base of trees. Colony sizes average a few hundred workers and a single queen. In all but two species, the queen is wingless and worker-like, differing from workers only in being slightly larger and with an enlarged mesosoma. In the remaining two species, the queens are fully winged, as they are in most other ants.

The taxonomy of these ants was examined by Wheeler (1934). However, our knowledge of these ants has grown considerably since that date and they are now in need of additional work.



Figs 354, 355.
Leptomyrmex ruficeps Emery worker from Gayundah Creek, Hinchinbrook Island, Queensland (head 1.35 mm wide).

Distribution and Habitats

Leptomyrmex contains 40 known species and subspecies (as well as a single fossil-based species) from New Guinea (and nearby islands), eastern Australia and New Caledonia. It was previously much more widely distributed according to fossils found in the Dominican Republic amber of Central America (Baroni Urbani 1980, Baroni Urbani and Wilson 1987). Within Australia, the 27 described species and subspecies range from Cape York Peninsula south along the east coast to the Melbourne region (Fig. 356). Most species are limited to medium-wet sclerophyll and rainforests while at least one species extends into dry sclerophyll and wattle scrub of east-central Queensland and New South Wales.

Fig. 356.
Collection sites for *Leptomyrmex* specimens.

List of Australian Species and Subspecies

darlingtoni Wheeler
darlingtoni fascigaster Wheeler
darlingtoni jucundus Wheeler
erythrocephalus (Fabricius)
erythrocephalus basirufus Wheeler
erythrocephalus brunneiceps Wheeler
erythrocephalus clarki Wheeler
erythrocephalus cnemidatus Wheeler
erythrocephalus decipiens Wheeler
erythrocephalus mandibularis Wheeler
erythrocephalus rufithorax Forel
erythrocephalus unctus Wheeler
erythrocephalus venustus Wheeler
froggatti Forel
mjobergi Forel
nigriventris (Guérin-Méneville)
nigriventris hackeri Wheeler
nigriventris tibialis Emery
unicolor Emery
varians Emery
varians angusticeps Santschi
varians quadricolor Wheeler
varians rothneyi Forel
varians ruficeps Emery
varians rufipes Emery
wiburdi Wheeler
wiburdi pictus Wheeler

LINEPITHEMA

Identification

The mandibles have 5–8 large teeth and 5–13 smaller denticles (Fig. 105b), with the first (apical) tooth elongate and much longer than the second (subapical) tooth (Figs 105c, 357). The front margin of the clypeus above the mandibles has a broad, shallow concavity (Figs 103a, 357).

Linepithema is superficially similar to some *Iridomyrmex* in overall body shape and colour, but differs in having more teeth on the mandibles, a more tear-drop shaped head (the widest point well above the eyes) (compare Figs 94a and 357 with Figs 95aa and 351), the relatively low placement of the eyes on the front of the head (Figs 103d, 357), and the weakly concave front margin of the clypeus (Figs 103a, 357).

Biology

Only a single species of *Linepithema, L. humile*, also known as the Argentine ant, is known to occur in Australia. It can be very common in both urban and some rural areas, with single colonies having many large nests connected by distinct foraging trails. They are known to cause damage to native plants (Bond and Slingsby 1984) by interfering with the germination and survival of young plants. They can also reduce the numbers of many native ants near their nests by dominating food sources and preventing other ants from feeding or nesting (Ward 1987). With very large colonies and rapid recruitment, they can monopolise food sources before others can find them, or overwhelm those that might have found them first.

Figs 357, 358.
Linepithema humile (Mayr) worker from Swan Hill, Victoria (head 0.57 mm wide).

In urban areas, these ants can be a significant pest. They establish large foraging trails into houses, seeking food and water, and can rapidly recruit large numbers of workers to newly found food sources. They can also establish small satellite nests indoors in potted plants, wall cavities, power points and almost any other small, suitable cavity. Their numbers can be reduced by removing all potential food sources, but generally complete elimination is almost impossible.

Distribution and Habitats

All but one of the 28 species and subspecies of *Linepithema* are limited to Central and South America. An additional two species are known from fossil records. The remaining species, the Argentine ant, is a widespread pest which has been introduced and established in North America, Europe, Canary Islands, Azores, southern Africa, Australia and Hawaii. Within Australia, the Argentine ant is limited to cool, southern areas including the Sydney region, the ACT, Victoria, Tasmania, the Adelaide area and south-western Western Australia (Fig. 359).

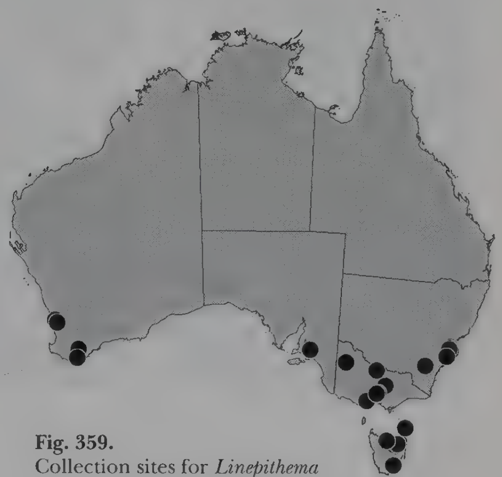


Fig. 359.
Collection sites for *Linepithema* specimens.

List of Australian Species

humile (Mayr) (Note: This species has recently undergone a name change from *Iridomyrmex humilis* (Mayr), the name under which it is known in previously published literature.)

Ochetellus

Identification

The front margin of the clypeus above the mandibles is broadly and shallowly concave in the centre with convex areas towards the sides (Fig. 360). The metanotal groove is a narrow, distinct notch in the relatively flat upper surface of the mesosoma (Figs 92b, 361). The rear face of the propodeum is concave (or less commonly flat) (Figs 92a, 361). The node of the petiole is thin, vertical, not inclined forward (Figs 92, 361), and the upper region is expanded towards the sides.

Ochetellus workers superficially resemble small workers of some *Dolichoderus* and small *Iridomyrmex* species in the shape of the mesosoma (with relatively flat upper surfaces and concave rear propodeal faces) but can be separated by their generally smaller size and the unique petiole, which is narrowed longitudinally and expanded laterally (compare Figs 92 and 361 with Figs 99, 346 and 352). The head shape, while not unique, tends to appear slightly flattened, giving a thinner profile than in most other dolichoderine genera.

Smaller species of *Iridomyrmex* may be confused with *Ochetellus* because of the similarly shaped mesosoma. However, the front margin of the clypeus always has a central projection in *Iridomyrmex* (Figs 94a, 351) while it is concave in *Ochetellus* (Fig. 360).

Biology

Species of *Ochetellus* nest in open soil or under rocks, in dead wood or arboreally. Workers forage arboreally or on the ground surface, sometimes forming foraging columns, where they

feed on a range of small arthropods. They often forage in houses where they show a preference for fluids and sweets. One species (*O. flavipes*) is adapted to the arid zone and nests in spinifex, building tunnels between its nests and foraging areas (Morton and Christan 1994).

Figs 360, 361.
Ochetellus worker from Eastwood State Forest, near Armidale, New South Wales (head 0.63 mm wide).

Distribution and Habitats

There are ten described species and subspecies of *Ochetellus,* which range from Japan south through Burma and the Philippines to Fiji, New Caledonia and Australia, as well as a single species in Mauritius. They are also known from the United States (Smith 1979) and New Zealand (Brown 1958a), but there seems little doubt that these latter occurrences are human introductions as both of the populations are limited to urban areas and are not known to occur in natural, undisturbed habitats. Within Australia, the four described species are most abundant along the east coast from Cape York Peninsula south to the Eyre Peninsula, as well as southern Western Australia (Fig. 362). In these areas they occur in forested areas, coastal heath and scrub, and wet and dry sclerophyll. In addition, *Ochetellus* is widely distributed but less common across much of inland Australia. Most of the arid zone records are of a single distinct species (*O. flavipes*) which is adapted to this habitat, while others are species similar to eastern and southern ones which occur in moist forested areas across the Top End, the Kimberley region and the north-west coast of Western Australia.

Fig. 362.
Collection sites for *Ochetellus* specimens.

List of Australian Species and Subspecies

flavipes (Kirby) (= *rostrinotus* Forel)
glaber (Mayr)
glaber clarithorax (Forel)
punctatissimus (Emery)

PAPYRIUS

Identification

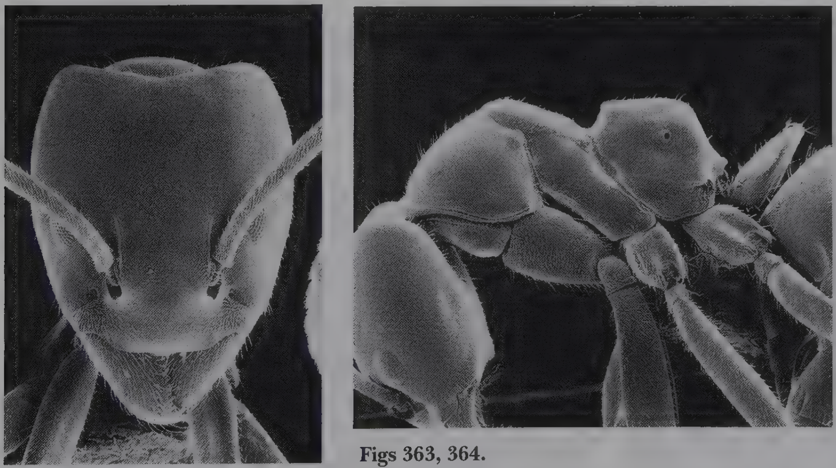
The palps are short and do not reach the underside of the head, and have a formula of 5:3 (the outer or maxillary palps with five segments, the inner or labial palps with three segments) (Fig. 83a). The front margin of the clypeus above the mandibles has 8–20 very short, straight hairs (Figs 85b, 363). The metanotal groove is a distinct, deep trough or notch which is depressed below the level of the surrounding mesonotum and propodeum (Figs 89d, 364). The propodeum is relatively high with flat upper and rear faces which are separated by a distinct rounded angle (Figs 89, 364).

Papyrius is one of the few Australian dolichoderines with a reduced palp formula and the only genus with a palp formula of 5:3. The shape of the metanotal groove and propodeum are also unique to these ants.

Biology

Nests of *Papyrius* are generally associated with trees or dead wood, either standing or on the ground (especially in southern areas), or in soil around the base of trees (especially in western and northern areas). In southern regions they commonly use plant fibres or frass to construct covers over their nests and feeding areas. Nests of the northern, soil-nesting species can be very large. They forage on low vegetation, trees, logs or on the ground, and are known to tend the caterpillars of several butterflies.

Papyrius workers are most often encountered at or near their nests. When disturbed, workers extend their legs and turn their gasters downward under their bodies. From this position, they can spray defensive secretions from the tips of their gasters at intruders. This chemical defence is well developed in these ants, the distinct odour produced being detected for some distance around the area of disturbance.



Figs 363, 364.
Papyrius worker from 64 km W of Esperence, Western Australia (head 1.22 mm wide).

Distribution and Habitats

The five described species and subspecies of *Papyrius* are limited to Australia and New Guinea. Within Australia they occur along the east coast from Cape York south through most of New South Wales and Victoria and into southern South Australia. They also occur in southern Western Australia and the Kimberley Region, as well as the Top End of the Northern Territory (Fig. 365). They have not been collected in Tasmania. Nests generally occur in forested areas, ranging from savannah woodlands through dry sclerophyll and into rainforests.

Fig. 365.
Collection sites for *Papyrius* specimens.

List of Australian Species and Subspecies

flavus (Mayr)
nitidus (Mayr) (= *tuberculatus* Lowne)
nitidus clitellarius (Viehmeyer)
nitidus queenslandensis (Forel)

PHILIDRIS

Identification

The front margin of the clypeus above the mandibles is highly modified with convex areas towards the sides and a weak central projection (Figs 98, 366). The compound eyes are placed relatively downward on the head, near the mandibles (Figs 98aa, 366). Most other genera in this subfamily have the front margin of the clypeus weakly convex (Figs 96aa, 335), straight or weakly concave (Figs 95aa, 332). Only *Froggattella* and *Iridomyrmex* share the central projection with *Philidris*, but *Froggattella* differs in having propodeal spines (Figs 64a, 349) while *Iridomyrmex* differs in having the eyes high on the head, well away from the clypeus (Figs 97a, 351).

Figs 366, 367.
Philidris worker from McIlwraith Range, Queensland (head 0.96 mm wide).

Biology

Species of *Philidris* form large nests containing many thousands of workers in cavities of living plants or in rotten wood above the ground. Some species are associated with plants that have special swollen stems in which the ants nest (these plants are called myrmecophytes, and include the genera *Myrmecodia* and *Hydnophytum*). *Philidris* workers are very aggressive when disturbed and will swarm in large numbers to attack intruders. Many species are also polymorphic, with workers varying greatly in size and with some having enlarged heads. These large-headed workers are equipped with powerful jaws which they use while excavating nests in tough plant tissues and rotten wood.

Distribution and Habitats

The 15 described species and subspecies of *Philidris* occur from extreme eastern India east through South-east Asia to the Philippine Islands, northern Australia and the Solomon Islands. Within Australia, the single described subspecies is limited to rainforests, mangroves and riparian vegetation on Cape York Peninsula south to about Cairns (Fig. 368).

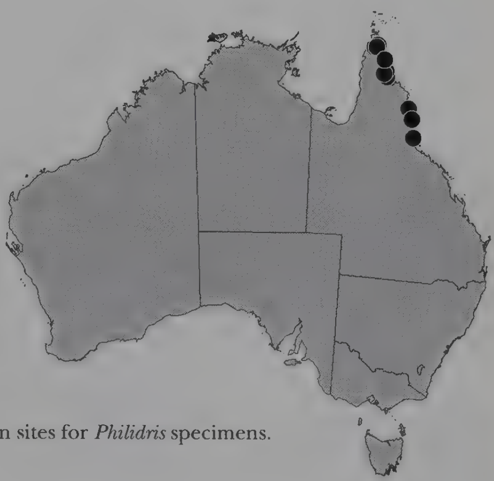


Fig. 368.
Collection sites for *Philidris* specimens.

List of Australian Subspecies

cordatus stewartii (Forel)

TAPINOMA

Identification

Mandibles have three or seven large teeth and about seven small denticles, and with the surface containing the teeth and the surface near the clypeus rounding gradually into one another (basal angle absent) (Fig. 57c). The upper surface of the propodeum is shorter than the rear surface (Figs 54b, 370). The node of the petiole is absent and its forward face is either lacking or very short and indistinct (Figs 54a, 370). The first segment of the gaster projects forward and partially or completely conceals the petiole when viewed from above (Figs 54, 370). The gaster has four segments on its upper surface (Fig. 59a).

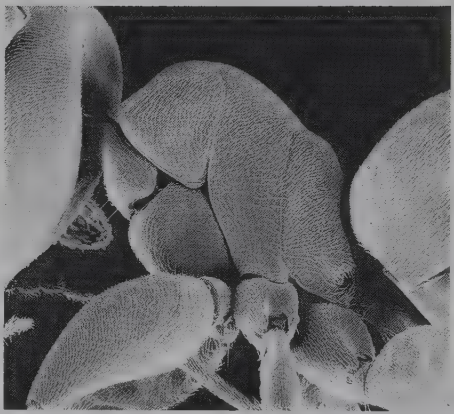
Tapinoma workers are most often confused with workers of *Bothriomyrmex*, *Doleromyrma*, *Plagiolepis* and *Technomyrmex* because of the overall similarity in size and body shape. They can be separated from the first three by the complete lack of a petiolar node (Figs 54a, 370) (these have a distinct forward face (Figs 101, 339) which is missing or is indistinct in *Tapinoma*) and the lack of an angle on the mandible between the face with the teeth and the face near the clypeus (Fig. 57c) (a basal mandibular angle is present in the others (similar to Fig. 58cc)). In addition, the eyes in *Bothriomyrmex* are often much smaller than those in *Tapinoma*, and *Plagiolepis* belongs to the subfamily Formicinae and has a small circular opening (acidopore) at the tip of the gaster (Figs 31a, 32a) (the tip of the gaster is slit-like in dolichoderines (Figs 33aa, 34aa)).

Separation of *Tapinoma* from *Technomyrmex* is based on the gaster. In *Tapinoma*, there are four segments on its upper surface (Fig. 59) while in *Technomyrmex* the gaster has five segments on its upper surface (although the fifth may be small and retracted in some specimens) (Fig. 60). In addition, *Technomyrmex* workers are generally larger than *Tapinoma* workers and are black rather than brown.

Biology

Tapinoma workers are often encountered foraging on low vegetation or when nests are found. They can be quite common and forage at all times of the day and night. Nests are found in a wide range of sites, including open soil, soil covered with rocks, between rocks, wood or other plant material, rotten or dead wood, plant stems, or almost any appropriately sized preformed cavity. Individual nests may be small, containing from a dozen to several hundred workers together with from one to several queens, or large with many thousands of workers and hundreds of queens. Colonies are often composed of several nests spread over a small area.

These ants are general scavengers but have a preference for honeydew and often tend aphids or coccids. They are especially fond of sweets and can be collected using honey baits on trees, especially at night. One species, *T. melanocephalum*, is an introduced pest widely distributed in tropical regions by human activity. This species forms large nests and will readily move indoors in search of food and water. The biology of one of the Australian species has been examined by Herbers (1991).



Figs 369, 370.
Tapinoma worker from 4.6 km NE of Piccadilly Circus, ACT (head 0.44 mm wide).

Distribution and Habitats

Tapinoma contains 88 species and subspecies and is found world-wide (excluding extreme northern regions and Antarctica). An additional two species are known from fossils. Within Australia, the six described species and subspecies are widespread (Fig. 371) in most habitats.

List of Australian Species and Subspecies

melanocephalum (Fabricius)
minutum Mayr
minutum broomense Forel
minutum cephalicum Santschi
minutum integrum Forel
rottnestense Wheeler

Fig. 371.
Collection sites for *Tapinoma* specimens.

TECHNOMYRMEX

Identification

Mandibles have seven or ten large teeth and 2–15 small denticles, and with the surface containing the teeth and the surface near the clypeus rounding gradually into one another (basal angle absent) (Fig. 57c). The upper surface of the propodeum is shorter than the rear surface (Figs 54b, 373). The node of the petiole is absent and its forward face is either lacking or very short and indistinct (Figs 54a, 373). The first segment of the gaster projects forward and partially or completely conceals the petiole when viewed from above (Figs 54, 373). The gaster has five segments on its upper surface (Fig. 60).

Technomyrmex is most likely to be confused with *Tapinoma*. They differ in that most species of *Technomyrmex* are larger in overall body size. They also differ in the number of segments on the upper surface of the gaster. In *Technomyrmex* the gaster has five segments on its upper surface (although the fifth may be small and retracted in some specimens) (Fig. 60) while in *Tapinoma* there are four segments on the upper surface (Fig. 59).

Biology

Technomyrmex workers are general scavengers, foraging on the ground, low vegetation and trees. They nest in the soil with or without a covering, in twigs or branches, under loose bark, and in nests constructed of plant fibres, which are attached under leaves or to tree trunks. Some species are known to have worker-like males and queens.

Workers of *Technomyrmex* commonly forage in houses in search of food and water. They enter through small cracks and, on finding a suitable food source, form distinct trails with many workers travelling between their nest sites and the food source. In general they nest outdoors but will sometimes establish small nests in a suitable location indoors near a well-maintained food supply.

Technomyrmex albipes is a pest species which has become widespread in tropical regions by the activities of humans. It can be common in disturbed habitats and is known to survive in cool climates by living indoors.

Figs 372, 373.
Technomyrmex worker from Mt Finnigan summit, Queensland (head 0.63 mm wide).

Distribution and Habitats

The 89 known species and subspecies of *Technomyrmex* occur from Africa east through southern Asia to Australia, with a single species (with one subspecies) known from Panama.

An additional species is known from fossil records. Within Australia, there are seven species and subspecies. These occur along the east coast from Torres Strait south through eastern Queensland, New South Wales, Victoria and Tasmania to Kangaroo Island, South Australia, as well as southern Western Australia and the Top End (Fig. 374). They are most common in moist, forested habitats.

List of Australian Species and Subspecies

albipes (Smith)
albipes cedarensis Forel
bicolor antonii Forel
foreli Emery
jocosus Forel
quadricolor (Wheeler)
sophiae Forel

Fig. 374.
Collection sites for *Technomyrmex* specimens.

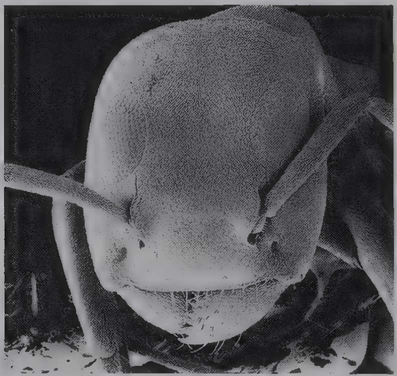
TURNERIA

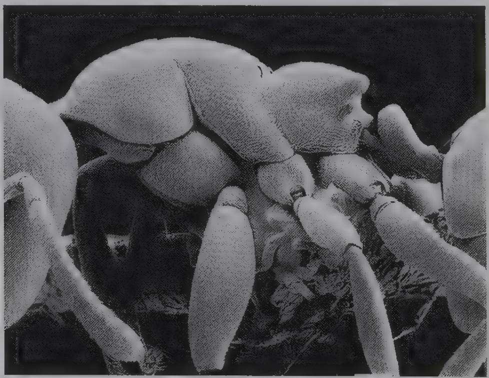
Identification

The compound eyes are elongate (Figs 67cc, 375) (rather than round or nearly round as in other dolichoderines). The propodeum has rounded protuberances at the angle between the upper and rear surfaces which bear the propodeal spiracles (Figs 65aa, 65bb, 376). These characters are unique to this genus and will separate it from all others in Australia.

Biology

All known species of *Turneria* live in trees above the ground and nest in dead twigs. They form small colonies which contain fewer than 500 workers. Once away from the nest foragers travel singly, searching on vegetation for suitable prey. They are not commonly collected although this is probably due to their small colony size and tree-nesting habits. Their biology and taxonomy were examined by Shattuck (1990).





Figs 375, 376.
Turneria bidentata Forel worker from Koala Park, Burleigh Heads, Queensland (head 0.61 mm wide).

Distribution and Habitats

Turneria is limited to Papua New Guinea, north-eastern Australia, the Solomon Islands and Vanuatu. Only one of the six known species occurs in Australia, where it has been from Cape York south to north-east New South Wales, and in the Darwin area (Fig. 377). *Turneria* species are found primarily in rainforests although they are occasionally encountered in tropical dry sclerophyll woodlands as well.

Fig. 377.
Collection sites for *Turneria* specimens.

List of Australian Species

bidentata Forel

Identification

The mesosoma is attached to the gaster by a single distinct segment, the petiole (Figs 19a, 385). The gaster is smooth, without constrictions between the segments (Fig. 19b). The sting is absent and the tip of the gaster has a small circular opening (an acidopore) which is often surrounded by a ring of short hairs (Figs 31a, 32a).

Species of Formicinae are most often confused with species of the subfamily Dolichoderinae because both have a single segmented petiole, lack a sting and are often similar in overall body size and shape. This is especially true for the smaller species such as those in *Plagiolepis.* However, formicines can always be separated from dolichoderines because the tip of the gaster has a small circular opening (Figs 31a, 32a) while all dolichoderines have a slit-like opening (Figs 33aa, 34aa).

Overview

These are some of the most common ants in Australia and can be found everywhere, often in large numbers. Most are general scavengers, foraging on the ground or on vegetation, and can be found at all times of the day and night. Nests are usually fairly large, with hundreds or thousands of workers, and range from small and cryptic to large and obvious. They are generally active and fast moving and many will defend their nests vigorously, attacking intruders with their large mandibles and formic acid sprays.

Species of formicines are found world wide, with over 3700 described species and subspecies and 49 genera. In Australia there are 404 described species and subspecies in 19 genera, with many species yet to be described. Of the 19 genera, six are found only in Australia.

Acropyga

Identification

The antennae have 10 or 11 segments (including the scape). The palps are short, do not extend along the under side of the head and have a formula of 2:3 (outer or maxillary palps with two segments, inner or labial palps with three segments) (Fig. 107a). The compound eyes are reduced, have at most about 30 individual facets (ommatidia) but often have only 4–6 (Figs 109b, 378, 379), or are completely absent. The mandibles have 3–5 teeth (Fig. 378).

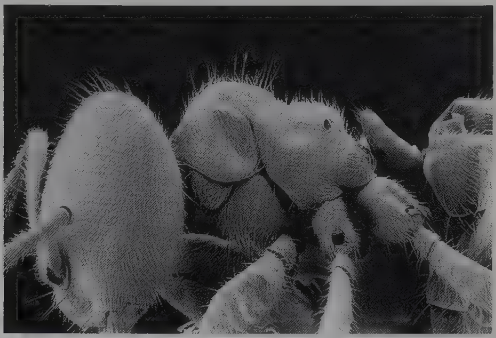
Species of *Acropyga* are small ants (less than 3.5 mm long) with a compact, stocky body (Fig. 379). They can be separated from other Australian formicines by their small eyes (Figs 109b, 378, 379), short palps with a palp formula of 2:3 (Fig. 107a), and in having only 3–5 mandibular teeth (Fig. 378). They are most often confused with small species of *Doleromyrma* and *Tapinoma* (both in the subfamily Dolichoderinae) and *Plagiolepis* because of their small size and similar overall body shape. However, they can be separated using the characters listed above.

Biology

These small ants are most often encountered in leaf litter or when nests are located, and less commonly foraging on low vegetation. Nests are known from a range of sites, including in soil with or without coverings, under bark on trees and in rotten logs. Because of their small size and cryptic nesting habits they are often overlooked.

At least one of the Australian species, *A. acutiventris,* is known to attend a species of mealybug (order Hemiptera). These mealybugs feed on the roots of plants and produce secretions which the ants collect and use as a food source. The relationship between the ants and these mealybugs has developed to such an extent that the mealybugs are known only from the ants' nests. To ensure that new ant nests are supplied with this specific mealybug,

new queens carry fertile female mealybugs in their mandibles during their nuptial flight. Thus new nests are assured of a supply of mealybugs to provide food for the new colony. For additional details on this relationship, see Williams (1978, 1985), Williams and Watson (1988) and Hölldobler and Wilson (1990).



Figs 378, 379.
Acropyga worker from Iron Range, Queensland (head 0.92 mm wide).

Distribution and Habitats

Of the 66 described species and subspecies of *Acropyga* only three occur in Australia. Their world-wide distribution includes the United States, Central and South America, Greece, southern Africa and then east to India, China and south-east Asia and Australia. Within Australia they are known to occur along the coast of Queensland south through eastern New South Wales, Victoria and into south-eastern South Australia, as well as southern Western Australia, the Kimberley region and the Top End of the Northern Territory (Fig. 380). They are absent from the arid regions of central Australia as well as Tasmania. They are found in a range of habitats from rainforests through wet and dry sclerophyll woodlands, savannah woodlands and mallee.

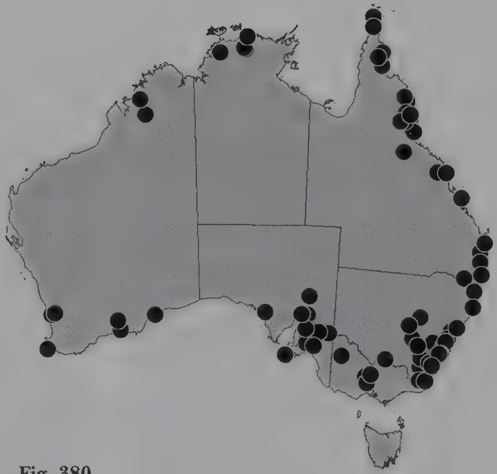


Fig. 380.
Collection sites for *Acropyga* specimens.

List of Australian Species

acutiventris Roger (= *moluccana australis* Forel)
indistincta Crawley
myops Forel

Anoplolepis

Identification

The antennae are 11-segmented (including the scape). The scapes are very long, surpassing the rear margin of the head by two-thirds their length or more (Fig. 113a). The body and legs are very elongate (Fig. 382).

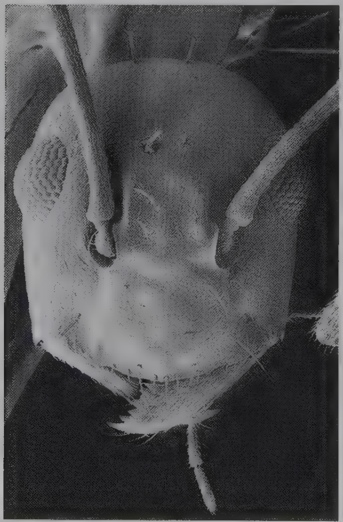
Anoplolepis is recognisable by its very long body and legs, pale yellow colour and 11-segmented antennae. It is most similar in overall size and shape to some species of *Camponotus* and *Leptomyrmex* (the latter in the subfamily Dolichoderinae) but it is easily separated from *Camponotus* by the number of antennal segments (*Camponotus* has 12 segments) and the presence of a metapleural gland opening above the hind leg (Fig. 120aa), and from *Leptomyrmex* by the circular opening (acidopore) at the tip of the gaster (Figs 31a, 32a) (a slit-shaped opening is present in *Leptomyrmex* (Figs 33aa, 34aa)).

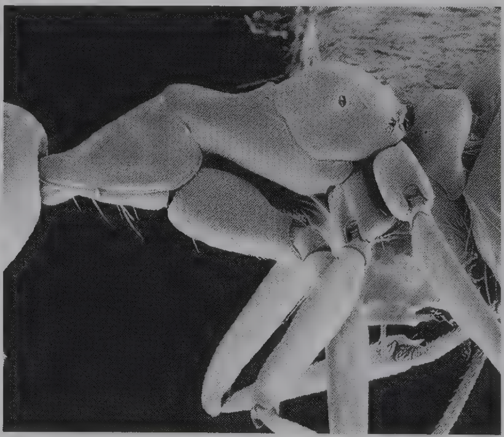
The only other genera of Formicinae in Australia with 11-segmented antennae are some *Acropyga* and all *Plagiolepis* and *Stigmacros. Anoplolepis* may be readily separated from these by the larger size, long legs and scapes, and yellow colour.

Biology

The single species of *Anoplolepis* known to occur in Australia, *A. gracilipes,* has been widely spread by human activities to many tropical areas. In some situations it has become a pest by invading dwellings, encouraging the increase of plant pests and diseases or disturbing or even killing domestic animals. In other situations, *A. gracilipes* has been considered a beneficial species as it has reduced the number of crop pests through its foraging activities. In these situations it has been actively encouraged and recommended as part of integrated pest management programs. For additional details see Way and Khoo (1992).

Nests of this species are primarily in the soil but may be arboreal as well. They are general predators on a range of arthropods and are known to tend Hemiptera to collect honeydew.





Figs 381, 382.
Anoplolepis worker from Kairiru Island, near Wewak, Papua New Guinea (head 0.62 mm wide).

Distribution and Habitats

The 31 known species and subspecies of *Anoplolepis* occur mainly in Africa with a single species widespread in tropical areas of Africa, Asia and the Australian region. The only Australian records of this genus are from the Gove Peninsula, Northern Territory (Fig. 383).

Fig. 383.
Collection sites for *Anoplolepis* specimens.

List of Australian Species

gracilipes (Smith) (Note: This species has recently undergone a name change from *A. longipes*, the name under which it is known in previously published literature.)

CALOMYRMEX

Identification

The antennal sockets are separated from the rear margin of the clypeus by a gap about as wide as the maximum scape diameter (Figs 129a, 384). The pronotum is separated from the metanotum by a distinct, flexible joint (visible as a distinct line separating these plates when viewed from above) (Figs 136bb, 385). The upper plate of the first segment of the gaster (first gastral tergite) is less than one-half the total length of the gaster (Fig. 136aa).

Species of *Calomyrmex* are usually darkly coloured and often have strong iridescent green, blue or purple reflections. Most species are also covered with long, erect hairs (Figs 384, 385). They are most similar to species of *Camponotus* in overall shape and size, but can be separated from them by the presence of a small opening above the hind leg (the metapleural gland opening) (Figs 120aa, 385) and in having all workers approximately the same size (being monomorphic) rather than varying in size (being polymorphic). Although not diagnostic, most species of *Calomyrmex* can be recognised in the field by the distinct way they raise their pointed gasters as they run and by the orange secretions which appear at the base of the mandibles when they are disturbed.

Biology

Species of *Calomyrmex* forage individually on low vegetation where they tend Hemiptera to collect honeydew and visit flowers and extrafloral nectaries to collect nectar and plant secretions. They only occasionally return to their nests with dead insects or other prey, and apparently do not attack living arthropods. During warm periods they may limit foraging to the cool morning and afternoon and during cooler weather they may only forage during warmer times of the day. Nests are in the soil with a single small entrance which is sometimes surrounded by a low mound of bare ground. For additional details of the biology of these ants see Brough (1976).

When disturbed, these ants secrete white to bright orange fluid from the base of the mandibles. The colour of the secretions changes with the age of the worker, varying from

white in young workers to dark orange in the oldest workers. These secretions have several roles. They act as an alarm signal to other ants in the area, as a defensive compound because of its viscous nature when it is exposed to air, and as a repellent to enemies or predators because of its repugnant properties. Its repellent properties are so strong that even small mammals will avoid these ants. For more information about these secretions, see Brough (1977, 1978, 1983).

Figs 384, 385.
Calomyrmex worker from 16 miles W of Coonana, Western Australia (head 2.05 mm wide).

Distribution and Habitats

The 14 described species and subspecies of *Calomyrmex* are restricted to Indonesia, New Guinea and Australia. Australia has the largest proportion of these, with 11 species and subspecies known to occur here. Within Australia, *Calomyrmex* is most common in arid to semi-arid regions as well as coastal Queensland (Fig. 386). They are absent from higher rainfall areas of New South Wales, Victoria, Tasmania and southern Western Australia.

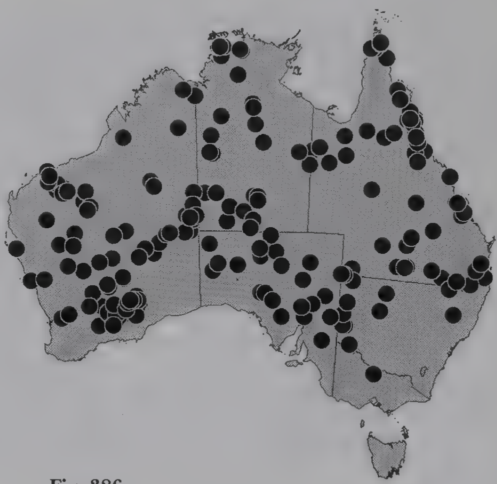


Fig. 386.
Collection sites for *Calomyrmex* specimens.

List of Australian Species and Subspecies

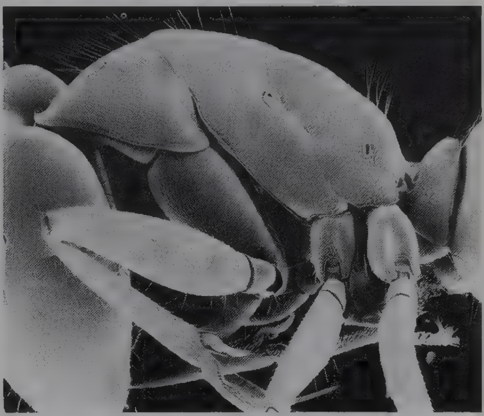
albertisi (Emery)
albopilosus (Mayr)
albopilosus wienandsi (Forel)
glauerti Clark
impavidus (Forel)
purpureus (Mayr)
purpureus smaragdinus Emery
similis (Mayr)
splendidus (Mayr)
splendidus mutans (Forel)
splendidus viridiventris Forel

CAMPONOTUS

Identification

The area above the hind leg is smooth and lacks a small opening (the metapleural gland opening, although this opening is present in one Australian species found on Cape York, see below) (Figs 119a, 388). The mesosoma and petiole lack spines or teeth on their upper surfaces (Figs 128bb, 388, 392). The mandibles have at most eight teeth. The scale of the petiole is usually upright and with an angular or rounded top (Figs 128, 388, 392), but when low the forward and top faces are always separated by a distinct angle. The upper plate of the first segment of the gaster (first gastral tergite) covers less than one-half the total length of the gaster (Fig. 128aa).

Camponotus is one of the largest and most diverse groups of ants in Australia. Species vary greatly in size and shape, ranging from about 2.5 mm to 14 mm in overall length. They are also polymorphic and show considerable size variation within single species (compare Figs 387 and 388 with Figs 389 and 390, and Figs 391 and 392 with Figs 393 and 394). Species of *Camponotus* can be separated from other Australian genera by the lack of a small opening above the hind legs (Fig. 119a), the presence of 5–8 teeth on the mandibles, the short first upper segment of the gaster (Fig. 128aa) and the lack of teeth or spines on the upper surfaces of the mesosoma and petiole (Fig. 388). A single Australian species differs from all other species of *Camponotus* (except for one species occurring in South-east Asia) in that it has a metapleural gland with an opening above the hind leg. This species can be recognised by its overall similarity to other species in the genus, especially the high, rounded shape of the mesosoma in side view, the distinct gap between the rear margin of the clypeus and the antennal sockets (Fig. 129a), and the presence of very long, golden-coloured hairs on the top of the mesosoma and gaster.

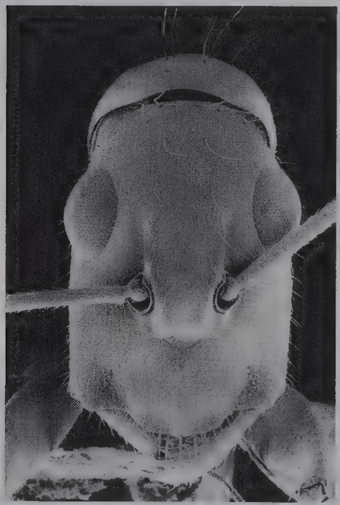


Figs 387, 388.
Camponotus major worker from Smith Point, Coburg Peninsula, Northern Territory (head 2.69 mm wide).

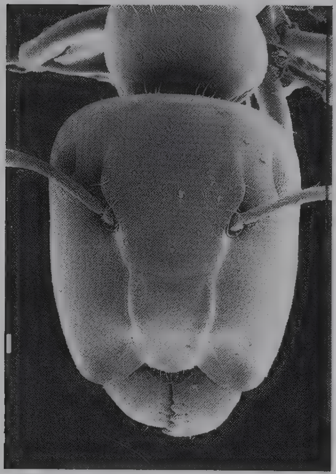
Biology

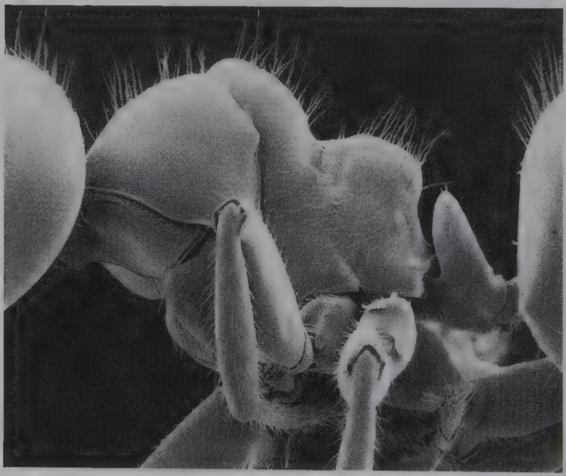
This is one of the most common and widespread groups of ants in Australia. They can be expected in all habitats throughout the continent. Nests are found in a wide range of sites including in soil with or without coverings, between rocks, in wood, among the roots of plants and in twigs on standing shrubs or trees. Some species will also nest in close association with meat ants of the genus *Iridomyrmex* (Greaves and Hughes 1974). Foraging times vary among species, with some found only during the day and others found only at night while others will forage at all times. Some of the nocturnal species will show little or no evidence of their presence during the day, but once night arrives they can be found in large numbers on the

ground or on low vegetation. They are general scavengers and predators and will collect nectar and plant secretions and tend Hemiptera for honeydew (Briese and Macauley 1981). One of the nocturnal species found in the southern arid zone (*C. gouldianus*) harbours Hemiptera in its nests during the day, apparently to protect them from predators. At night workers carry their guests into trees and shrubs and allow them to feed, thus producing honeydew which is collected by the ants. In another arid zone species (*C. inflatus*) selected workers act as living storage vessels. These special workers, called repletes, are the well-known honey-pot ants. They receive fluids from returning foragers, expanding their gasters until they are many times larger than normal. They become so swollen that leaving the nest is impossible and they remain inside, hanging from the ceiling of the nest chamber. Other species of *Camponotus* are closely associated with butterflies, the caterpillars of some species being found only in the nests of these ants. For notes on the biology and taxonomy of species related to *C. nigriceps* see McArthur and Adams (1996).

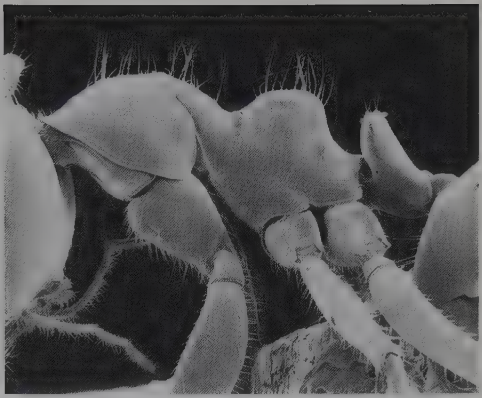


Figs 389, 390.
Camponotus minor worker from Smith Point, Coburg Peninsula, Northern Territory (head 1.11 mm wide).





Figs 391, 392.
Camponotus vitreus (Smith) major worker from Lake Placid, near Cairns, Queensland (head 1.48 mm wide).



Figs 393, 394.
Camponotus vitreus (Smith) minor worker from Lake Placid, near Cairns, Queensland (head 0.91 mm wide).

Distribution and Habitats

Camponotus is the largest genus in the world with 1518 described species and subspecies (as well as 22 fossil species). The genus is well represented in Australia with 128 described species and subspecies. They are found world wide (except polar regions), including throughout Australia (Fig. 395), and in all terrestrial habitats.

Fig. 395.
Distribution of *Camponotus*.

List of Australian Species and Subspecies

adami Forel
aeneopilosus Mayr
aeneopilosus flavidopubescens Forel
afflatus Viehmeyer
arcuatus Mayr
arcuatus aesopus Forel
armstrongi McAreavey
aurocinctus (Smith)
bigenus Santschi
cameratus Viehmeyer
capito Mayr
capito ebeninithorax Forel
ceriseipes Clark
chalceoides Clark
chalceus Crawley
chloroticus Emery
cinereus Mayr
cinereus amperei Forel
cinereus notterae Forel
clarior Forel
claripes Mayr
claripes elegans Forel
claripes inverallensis Forel
claripes marcens Forel
claripes minimus Crawley
claripes nudimalis Forel
claripes orbiculatopunctatus Viehmeyer
claripes piperatus Wheeler
consectator (Smith)
consobrinus (Erichson) (= *dimidiatus* Roger, *nigriceps obniger* Forel)
crenatus Mayr

denticulatus Kirby
discors Forel
discors angustinodis Emery
discors laetus Emery
discors yarrabahensis Forel
dorycus (Smith)
dorycus confusus Emery
dromas Santschi
dryandrae McArthur and Adams
eastwoodi McArthur and Adams
ephippium (Smith)
ephippium narses Forel
eremicus Wheeler
esau Forel
evae Forel
evae zeuxis Forel
extensus Mayr
ezotus Bolton (= *erythropus* Viehmeyer)
fieldeae Forel
fieldellus Forel
froggatti Forel
gasseri (Forel)
gasseri caloratus Wheeler
gasseri lysias Forel
gasseri obtusitruncatus Forel
gibbinotus Forel
gouldianus Forel
hartogi Forel (= *ferruginipes* Crawley)
horni Clark
howensis Wheeler
inflatus Lubbock (= *aurofasciatus* Wheeler)
innexus Forel
insipidus Forel
intrepidus (Kirby) (= *agilis* Smith, *magnus* Mayr)
intrepidus bellicosus Forel
janeti Forel
johnclarki Taylor (= *sanguinea* Clark)
latrunculus Wheeler
latrunculus victoriensis Santschi
leae Wheeler
lividicoxis Viehmeyer
lividipes Emery
longideclivis McArthur and Adams
loweryi McArthur and Adams
lownei Forel (= *nitida* Lowne)
macareaveyi Taylor (= *sanguinea* McAreavey)
macrocephalus (Erichson) (= *fictor* Forel)
macrocephalus augustulus Viehmeyer
michaelseni Forel
midas Froggatt
molossus Forel
myoporus Clark
nigriceps (Smith) (= *nigriceps dimidiatus perthiana* Forel, *consobrinus perthianus* Wheeler)
nigroaeneus (Smith)
nigroaeneus divus Forel
nigroaeneus xuthus Forel
novaehollandiae Mayr
oetkeri Forel
oetkeri voltai Forel
oxleyi Forel
pallidiceps Emery
pellax Santschi
peseshus Bolton (= *nitidiceps* Viehmeyer)
postcornutus Clark
prostans Forel
punctiventris Emery
reticulatus mackayensis Forel
rubiginosus Mayr
rufus Crawley
sanguinifrons Viehmeyer
scratius Forel
scratius nuntius Forel
semicarinatus (Forel)
simulator Forel
spenceri Clark (= *reticulatus* Kirby)
spinitarsus Emery
sponsorum Forel
subnitidus Mayr
subnitidus famelicus Emery
subnitidus longinodis Forel
suffusus (Smith) (= *piliventris* Smith, *schencki* Mayr)
suffusus bendigensis Forel
tasmani Forel
terebrans (Lowne) (= *testaceipes* Smith, *darlingtoni* Wheeler, *rottnesti* Donisthorpe)
tricoloratus Clark
tristis Clark
tumidus Crawley
versicolor Clark
villosus Crawley
vitreus (Smith) (= *adlerzii* Forel)
walkeri Forel (= *walkeri bardus elongatus* Crawley)
walkeri bardus Forel
whitei Wheeler (= *scutellus* Clark)
wiederkehri Forel
wiederkehri lucidior Forel

ECHINOPLA

Identification

The antennae are inserted away from the rear margin of the clypeus by a gap about as wide as the maximum scape diameter (Figs 129a, 396). The upper plate of the first segment of the gaster (first gastral tergite) is very long and covers most of the gaster (Fig. 135a). The pronotum and mesonotum (when viewed from above) are completely connected and not separated by an impression or line (Figs 135b, 397). The node of the petiole is expanded laterally and is armed with a number of teeth (Figs 135c, 397).

The long first upper plate of the gaster (Fig. 135a) and the presence of teeth on the sides of the petiole (Fig. 135c) are unique to these ants and will separate them from all others. Additionally, most species are hairy, with elongate, erect hairs present on most regions of the body (Figs 396, 397), and have strong green, purple or red iridescence.

Biology

The two Australian species of *Echinopla* nest and forage arboreally. Foragers are most often encountered during the day, almost exclusively on foliage and only rarely on the ground. Nests occur in dead twigs, vines or branches on live trees. They are infrequently collected, probably because they are found well above the ground and their nests and foraging areas are not readily accessible. There have been no detailed studies undertaken with these ants, although Taylor (1992) reviewed the Australian species and included notes on their biology.

Figs 396, 397.
Echinopla australis Forel worker from Deeral Landing, Mulgrave River, Queensland (head 1.22 mm wide).

Distribution and Habitats

The 26 described species and subspecies of *Echinopla* occur from Singapore and Sumatra east to the Philippines, Papua New Guinea and Australia. Two species are known from Australia, both along the east coast of Queensland from Cape York south to about Rockhampton (Fig. 398). They show a strong preference for rainforests and mangroves although they occasionally occur in riparian woodlands.

List of Australian Species

australis Forel
turneri Forel (= *turneri pictipes* Forel)

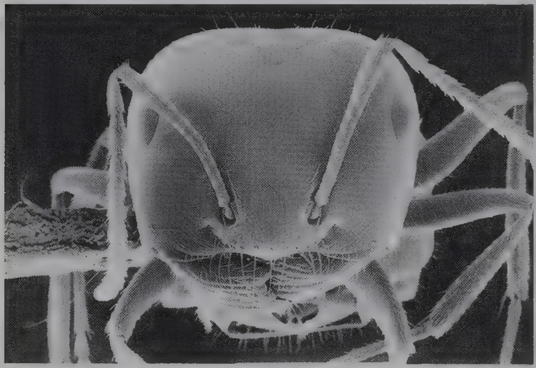
Fig. 398.
Collection sites for *Echinopla* specimens.

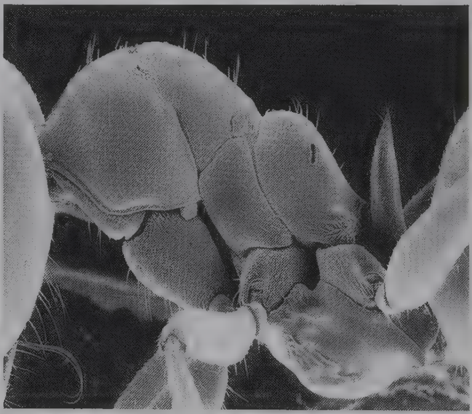
Melophorus

Identification

The spiracle on the propodeum is elongate and slit-like (Figs 146a, 400). The underside of the head and mandibles usually have numerous elongate hairs (Figs 148b, 400) although in some species these hairs are reduced to only two or three on the under side of the head and are absent from the mandibles. A small opening which is usually fringed with hairs (the metapleural gland opening) is present above the hind leg (Figs 120aa, 400).

Melophorus is one of the most abundant and diverse groups of ants in the arid zone of Australia. They are most similar to some species of *Camponotus* in general body size and shape; however, they differ in having a small opening above the hind leg (Figs 120aa, 400) and a much longer and narrower propodeal spiracle (Figs 146a, 400).





Figs 399, 400.
Melophorus worker from Sandringham, Queensland (head 1.75 mm wide).

Biology

These ants are common in most areas of Australia with the exception of cool, wet areas. Foraging is strictly during the day, and in the arid zone they are one of the only ants active during the hottest part of the day. Some species reduce foraging activity during the winter, although in cooler areas most species will forage on warmer winter days. They are omnivores and some species will collect seeds (Briese and Macauley 1981). Some species have become

highly modified with very flattened bodies, presumably to allow foraging in small, thin crevices (Greenslade 1979). A few species are also known to prey on the larvae and pupae of meat ants in the genus *Iridomyrmex* (Clark 1941). All species form ground nests in the open, often with a small amount of dirt near the entrance. Workers of *Melophorus* are some of the fastest and most timid ants in Australia. On hot days they can run so rapidly that they can be difficult to capture. They are also so shy that the slightest disturbance near a nest will cause workers to disperse or disappear into the nest, only returning or becoming active again after many minutes.

Distribution and Habitats

The 29 described species and subspecies of *Melophorus* are only known to occur in Australia. They are found in all areas except south-western Tasmania (Fig. 401), although they are by far the most abundant and diverse in the arid and semi-arid zone. They can be found in all of the drier habitats, being much less common or absent from wet sclerophyll, especially in southern regions, and they are absent from rainforests.

Fig. 401.
Distribution of *Melophorus*.

List of Australian Species and Subspecies

aeneovirens (Lowne)
bagoti Lubbock (= *cowlei* Froggatt)
biroi Forel
bruneus McAreavey
constans Santschi
curtus Forel
fieldi Forel
fieldi major Forel
fieldi propinquus Viehmeyer
fulvihirtus Clark
hirsutus Forel
insularis Wheeler
iridescens (Emery)
iridescens fraudatrix Forel
iridescens froggatti Forel
laticeps Wheeler
ludius Forel
ludius sulla Forel
marius Forel
mjobergi Forel
omniparens Forel
pillipes Santschi
potteri McAreavey
scipio Forel
turneri Forel
turneri aesopus Forel
turneri candidus Santschi
turneri perthensis Wheeler
wheeleri Forel

MYRMECORHYNCHUS

Identification

The mandibles usually have 10–13 teeth (Figs 154b, 404), although some large individuals have as few as six (Fig. 402). The frontal carinae are distinctly arched (Figs 154a, 402, 404). The upper surface of mesosoma between the metanotum and propodeum is always low and

flat or concave and never expanded upwards (Figs 156c, 403, 405). The worker caste is variable in size (strongly polymorphic) and has distinct major and minor workers (compare Figs 402 and 403 with Figs 404 and 405).

Smaller workers of *Myrmecorhynchus* are identifiable by the large number of teeth on the mandibles (Figs 154b, 404). However, larger workers have a reduced number of teeth (as few as six in some individuals (Fig. 402)) and are similar to some species of *Notoncus* (Figs 155bb, 407). These individuals can be identified by the configuration of the frontal carinae, which are curved in *Myrmecorhynchus* (Figs 154a, 402, 404) and straight in *Notoncus* (Figs 155aa, 407, 409), and the polymorphic worker caste with distinct majors and minors (*Notoncus* is weakly polymorphic and without distinct majors and minors). Additionally, some species of *Notoncus* have an upward projection on the upper surface of the mesosoma at the metanotal groove (Figs 157cc, 410). This region of the mesosoma is always flat or concave in *Myrmecorhynchus* (Figs 156c, 403, 405).

Biology

These small inconspicuous ants nest in soil or in twigs and vines on shrubs or trees. They are most often encountered while foraging on vegetation. Although they are can be locally common they are often overlooked. The little which is known concerning their habits has been summarised by Wheeler (1917).

Figs 402, 403.
Myrmecorhynchus major worker from 10 miles S of Kiama, New South Wales (head 1.53 mm wide).

Figs 404, 405.
Myrmecorhynchus minor worker from 10 miles S of Kiama, New South Wales (head 1.00 mm wide).

Distribution and Habitats

The five described species of *Myrmecorhynchus* are found only in Australia. They occur in forested areas ranging from mallee through rainforests along the east coast of Queensland, eastern and southern New South Wales, Victoria, Tasmania, southern South Australia and southern Western Australia (Fig. 406).

List of Australian Species

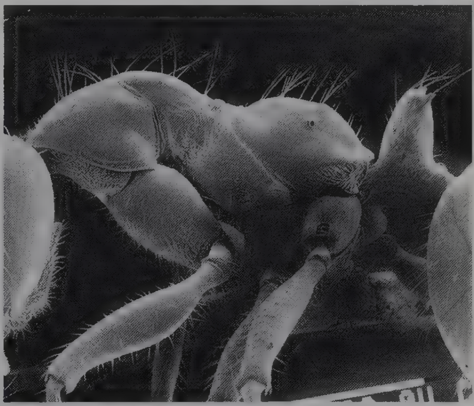
carteri Clark
emeryi André
musgravei Clark
nitidus Clark
rufithorax Clark

Fig. 406.
Collection sites for *Myrmecorhynchus* specimens.

NOTONCUS

Identification

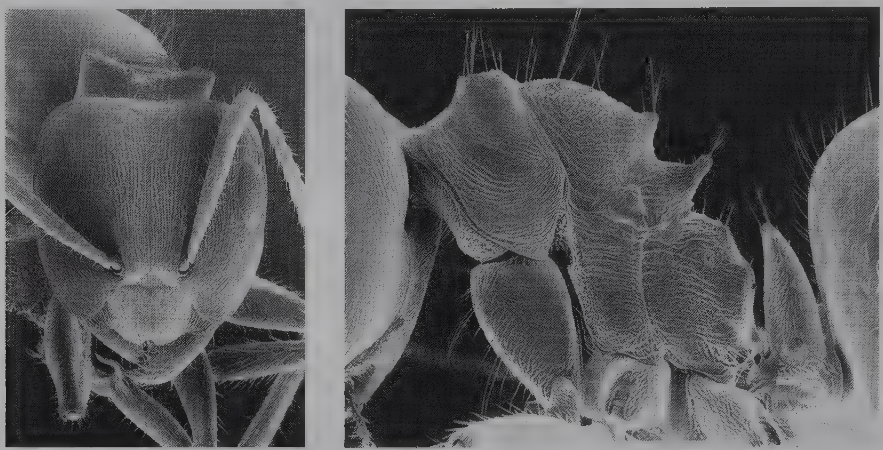
The mandibles have six or seven teeth (Figs 155bb, 407, 409). The frontal carinae are weakly arched or straight along their entire length (except the extreme forward ends near the antennal sockets, which are curved) (Figs 155aa, 407, 409). The worker caste is only slightly variable in size (weakly polymorphic) and without distinct major and minor workers. The upper surface of the mesosoma between the mesonotum and propodeum is sometimes expanded upwards into a rounded or angular process (Figs 157cc, 410), or it may be flat (Figs 158dd, 408).



Figs 407, 408.
Notoncus spinisquamis (André) worker from near Forest, Victoria (head 1.63 mm wide).

Notoncus contains two distinct sets of species. One set has a distinct rounded or angular projection extending upward from the area between the mesonotum and propodeum (Figs 157cc, 410). This configuration is highly distinctive within the Australian formicines (the only other occurrance being in a single species of *Melophorus*) and can be used to identify these species. The other set of species has the upper surface of the mesosoma flat or weakly concave and not set off from the surrounding regions of the mesosoma (Figs 158dd, 408). These

species are similar to *Myrmecorhynchus* in overall shape and size and can be distinguished from them by their straight frontal carinae (Figs 155aa, 407), and by their being only weakly polymorphic and without distinct major and minor workers. They also have only six or seven teeth on the mandibles (Figs 155bb, 407) while all but the largest *Myrmecorhynchus* workers have between 10 and 13 teeth (Figs 154b, 404).



Figs 409, 410.
Notoncus ectatommoides (Forel) worker from 40 km W of Bollon, Queensland (head 1.68 mm wide).

Biology

Nests of these common ants are found in open soil or under stones and logs on the ground. They are general predators, foraging on the ground surface. Although they are active all year, in some areas they can be more active during the winter (Andersen 1986). For reviews of their taxonomy see Brown (1955) and Taylor (1992).

Distribution and Habitats

Notoncus is an Australian genus with one of its species also occurring in Papua New Guinea. They are found widely in eastern Queensland, New South Wales, Victoria, Tasmania, southern South Australia and southern Western Australia, with a limited number of collections from northern South Australia and southern Northern Territory (Fig. 411). They are found in a wide range of forested habitats from mallee and mulga woodlands to rainforests. They are also common in urban gardens and parks.

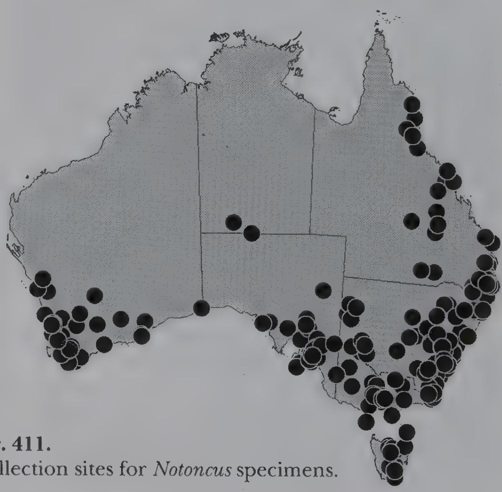


Fig. 411.
Collection sites for *Notoncus* specimens.

List of Australian Species

capitatus Forel (= *mjobergi* Forel, *capitatus minor* Viehmeyer)
ectatommoides (Forel) (= *foreli* André, *foreli acuminata* Viehmeyer, *foreli dentata* Forel, *foreli subdentata* Forel, *rodwayi* Donisthorpe)
enormis Szabó
gilberti Forel (= *gilberti annectens* Wheeler, *gilberti annectens manni* Wheeler, *gilberti gracilior* Forel, *politus* Viehmeyer)
hickmani Clark (= *rotundiceps* Clark)
spinisquamis (André)

NOTOSTIGMA

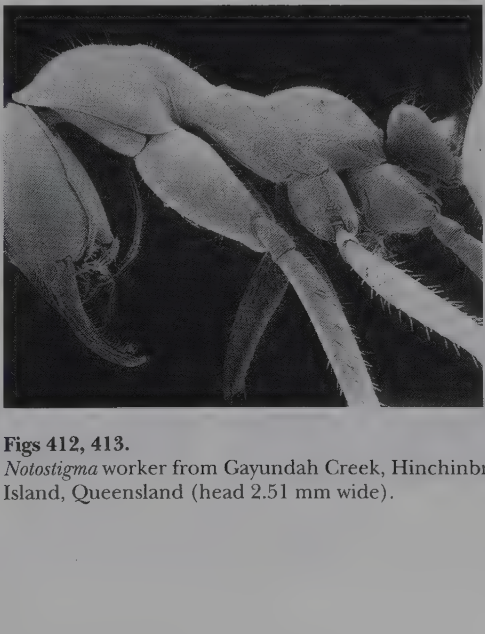
Identification

The antennal sockets are separated from the rear margin of the clypeus by a gap greater than the smallest diameter of the scape (Figs 129a, 412). The mandibles have more than ten teeth (Figs 133a, 412). The simple eyes (ocelli) are present on the top of the head (Figs 133b, 412). They are large ants, over 10 mm in total length, with elongate bodies and long antennal scapes (Figs 412, 413).

Species of *Notostigma* can be separated from other formicines by their large body size, long scapes, numerous mandibular teeth and the presence of a small opening above the hind legs (the metapleural gland opening) (Figs 120aa, 413). They are most commonly confused with larger species of *Camponotus*, but they differ as mentioned above.

Biology

Species of *Notostigma* are among the largest ants found in Australia. They can be quite common where they occur, but because they forage singly and almost exclusively at night they are often overlooked. Nests are in soil, either with a moderately large mound of soil around the entrance (in the case of *N. foreli*) or under stones or wood (in the case of *N. carazzii*). Foraging activity is apparently limited to the ground surface. The biology and taxonomy of these ants has been reviewed by Taylor (1992).



Figs 412, 413.
Notostigma worker from Gayundah Creek, Hinchinbrook Island, Queensland (head 2.51 mm wide).

Distribution and Habitats

Notostigma is only known from Australia. Species occur in rainforests or, less commonly, in wet sclerophyll forests. The two species are found in separate areas, with *N. carazzii* known from about Mt Carbine south to Eungella National Park, Queensland, and *N. foreli* occurring in extreme south-east Queensland and north-east New South Wales, with an isolated population in Myall Lake National Park (Fig. 414).

List of Australian Species

carazzii (Emery) (= *podenzanai* Emery)
foreli Emery

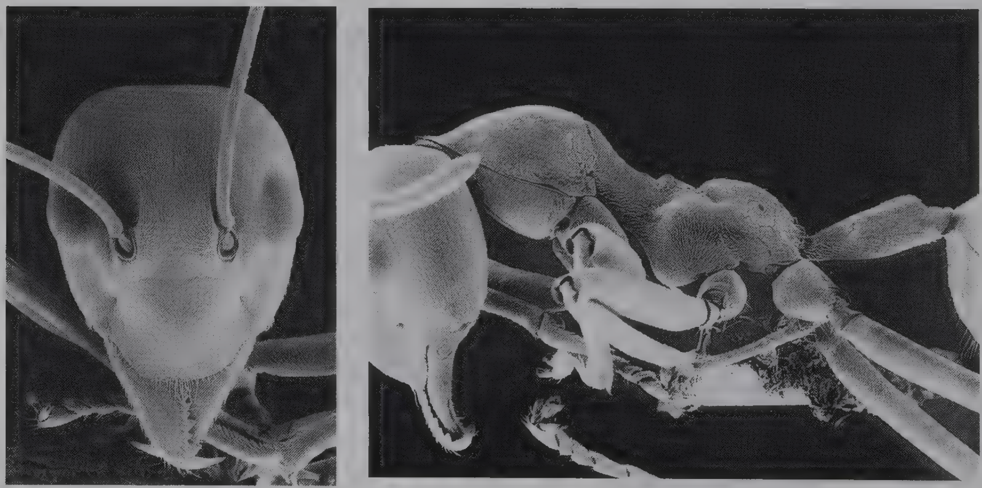
Fig. 414.
Collection sites for *Notostigma* specimens.

OECOPHYLLA

Identification

The mandibles have ten or more teeth (Figs 121a, 415). The palp formula is 5:4 (the outer or maxillary palps with five segments, the inner or labial palps with four segments) (Fig. 123c). The area above the hind leg is smooth and without a small opening (the metapleural gland opening) (Figs 119a, 416). The scale of the petiole is low and rounded, without distinct front, top or rear faces (Figs 125b, 416).

Oecophylla has a single species in Australia (*O. smaragdina*), which is the well-known green tree or weaver ant of northern regions. They are recognisable by their elongate, pale yellow and/or green bodies (Fig. 416), numerous mandibular teeth (Fig. 415) and the reduced number of palp segments (Fig. 123c) (6:4 in most other formicines).



Figs 415, 416.
Oecophylla smaragdina (Fabricius) worker from Black Point, Coburg Peninsula, Northern Territory (head 1.51 mm wide).

Biology

Nests of *O. smaragdina* are always in trees or shrubs and are constructed by attaching leaves together with silk produced by their larvae. Individual colonies can become very large with many separate nests spread over several trees. They are very aggressive and will vigorously attack intruders. Foraging takes place both on vegetation and on the ground, and they are predacious. Because of their large population sizes and predacious habits, these ants have been used as biological control agents (Way and Khoo 1992).

Distribution and Habitats

Oecophylla contains 11 fossil and two extant species (the latter each with several subspecies). The extant species are found in tropical regions of Africa and India east through South-east Asia and into northern Australia. Within Australia they occur in forested areas of northern Western Australia, the Northern Territory and Queensland, extending south along the Queensland coast to approximately Rockhampton (Fig. 417). For details of their distribution see Lokkers (1986).

Fig. 417.
Collection sites for *Oecophylla* specimens.

List of Australian Species

smaragdina (Fabricius) (= *virescens* Fabricius, *viridis* Kirby)

OPISTHOPSIS

Identification

The eyes are very large and placed on the rear corners of the head so that they form part of the outline of the head when viewed from the front (Figs 131a, 418).

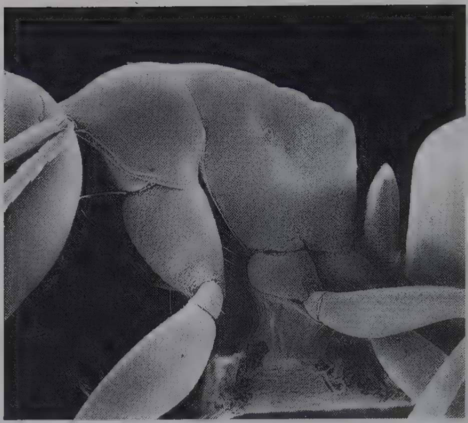
Species of *Opisthopsis* are immediately recognisable by the unique placement of their compound eyes (Figs 131a, 418). These large, rearward-placed eyes do not occur in any other Australian ants. Most species (including those most commonly encountered) are also distinctly coloured with bright yellow or orange and dark brown or black markings.

Biology

Opisthopsis is one of the most distinctive ants in Australia and can be found in large numbers in appropriate habitats. The workers are generally brightly coloured and forage on the ground as well as on vegetation. They run rapidly with short, jerky motions, and are often out during the hottest part of the day. Being equipped with large eyes, they have very acute vision, and capturing foragers can be a challenge. They will skip out of harm's way when approached on the ground or dart to the far side of a branch or leaf if foraging on vegetation.

Nests are either in the soil or in branches on trees or large shrubs. Ground nests are often in active termite mounds or in larger ant nests such as those of some *Rhytidoponera* species. Colonies generally contain at most several hundred workers and one or several queens.

Two species of *Opisthopsis* have so far been found only in the nests of other species of the genus. It is suspected that these are parasitic species using other *Opisthopsis* species to raise their young, but detailed studies of these species are yet to be undertaken. The biology and taxonomy of these ants has been reviewed by Wheeler (1918).



Figs 418, 419.
Opisthopsis worker from 5 km E by S of Smith Point, Northern Territory (head 1.63 mm wide).

Distribution and Habitats

The 20 described species and subspecies of *Opisthopsis* occur from eastern Indonesia east to the Solomon Islands and south to southern Australia. Within Australia, 15 species and subspecies are known. These species are widespread although they are absent from the cool, wet regions of south-eastern New South Wales, southern Victoria, Tasmania and south-western Western Australia (Fig. 420). While they can be found in all major habitats, they are less common in rainforests.

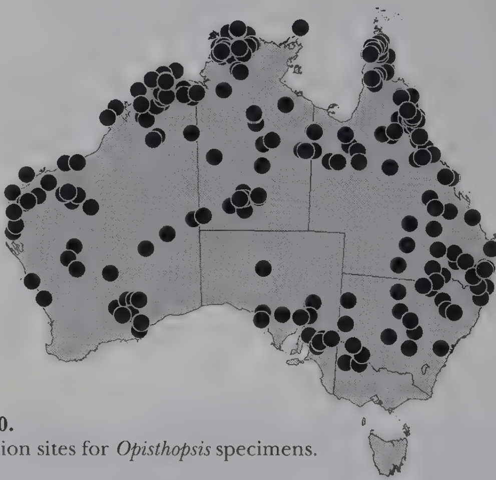


Fig. 420.
Collection sites for *Opisthopsis* specimens.

List of Australian Species and Subspecies

diadematus Wheeler
diadematus dubius Wheeler
haddoni Emery
haddoni rufoniger Forel
jocosus Wheeler
lienosus Wheeler
major Forel
maurus Wheeler
pictus Emery
pictus bimaculatus Wheeler
pictus lepidus Wheeler
pictus palliatus Wheeler
respiciens (Smith)
respiciens moestus Wheeler
rufithorax Emery

PARATRECHINA

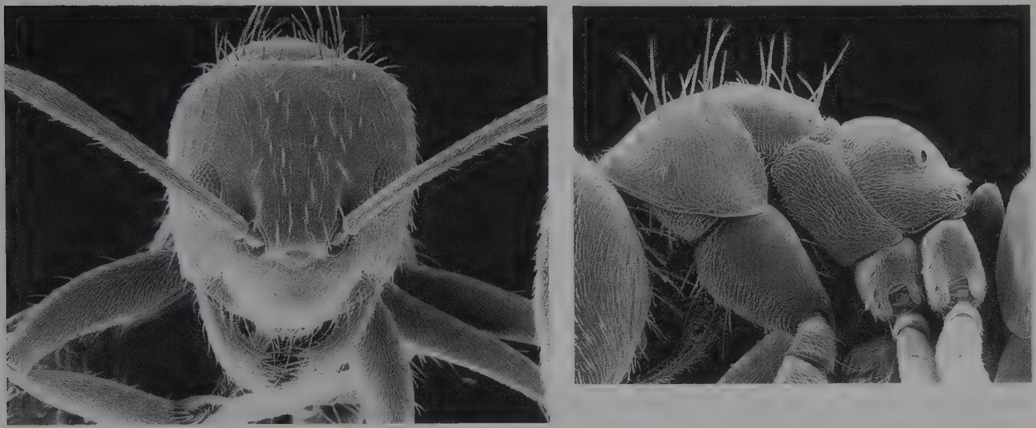
Identification

The upper surface of the mesosoma with pairs of large, distinct hairs on the pronotum and mesonotum (Figs 142a, 422). The overall body size is small to medium (between 1.2 mm and

2.5 mm). They are recognisable by the large, stout pairs of erect hairs on the upper surface of the mesosoma. No other Australian ants have these distinctive hairs.

Biology

Paratrechina form large colonies in open soil or under rocks or other objects, or in rotten wood on the ground. They can be locally abundant with nests easily found. Some species are known to forage primarily at night. One of the northern species (*P. longicornis*) is a widespread introduced tramp in many tropical countries and has been introduced into Australia through human activity.



Figs 421, 422.
Paratrechina worker from Upper Allyn Valley, near Eccleston, New South Wales (head 0.73 mm wide).

Distribution and Habitats

The 147 known species and subspecies of *Paratrechina* occur in Europe and Africa east through India, China and south into Indonesia and Australia. They are also known from North and South America. The ten known species and subspecies found in Australia are widespread although they are most common in northern and eastern areas and are rare or absent from western South Australia and eastern Western Australia (Fig. 423). They occur in dry sclerophyll and coastal scrub through wet sclerophyll and into rainforests.

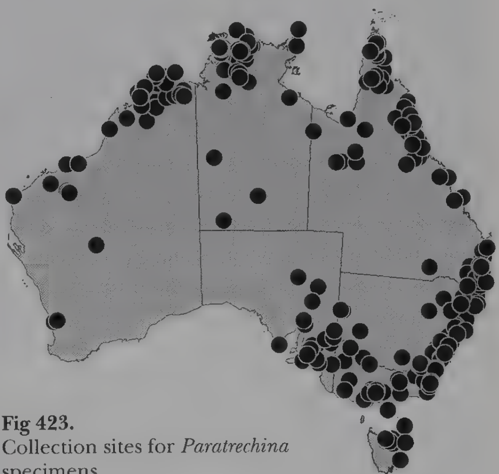


Fig 423.
Collection sites for *Paratrechina* specimens.

List of Australian Species and Subspecies

bourbonica (Forel)
braueri (Mayr)
braueri glabrior (Forel)
longicornis (Latreille)
minutula (Forel)
nana Santschi
obscura (Mayr)
rosae (Forel)
tasmaniensis (Forel)
vaga (Forel)

PLAGIOLEPIS

Identification

The antennae are 11-segmented (including the scape). The scapes surpass the rear margin of the head by less than one-quarter their length (Figs 114aa, 424). The eyes have more than 20 facets (ommatidia) in their greatest diameter (Fig. 424). The propodeum is rounded and lacks teeth or protuberances (Fig. 425).

Members of *Plagiolepis* are small ants (maximum size about 2 mm) with a compact, stocky body (Fig. 425). They can be separated from other Australian formicines by their 11-segmented antennae, which have the second and third segments of the funiculus (counting from the scape) each much shorter than the fourth segment (Figs 116bb, 424), and their long palps which have a palp formula of 6:4 (the outer or maxillary palps with six segments, the inner or labial palps with four segments) (Fig. 108aa). They are most often confused with species of *Doleromyrma* and *Tapinoma* (both in the Dolichoderinae) and *Acropyga* because of their similar overall body size and shape.

Biology

These small, inconspicuous ants nest in soil under rocks or logs or in rotten wood on the ground. They forage on the ground as well as on tree trunks. While they are often common they are frequently overlooked because of their small size (the largest workers are less than 3.0 mm long and many workers are less than 2.0 mm). They are general predators and will tend Hemiptera on vegetation and under bark.

Figs 424, 426.
Plagiolepis worker from Black Mountain, ACT (head 0.44 mm wide).

Distribution and Habitats

The 74 known species and subspecies of *Plagiolepis* occur in southern Europe, Russia, Africa and east through India, Korea and south though Asia and into Australia. There are also an additional seven species known only from fossils. Within Australia six species and subspecies occur in mallee and savannah woodland through dry and wet sclerophyll and into rainforests. They are found along the east coast of Queensland and throughout New South Wales, Victoria, Tasmania, in eastern South Australia and southern Western Australia, with a single collection from southern Northern Territory (Fig. 427).

Fig. 427.
Collection sites for *Plagiolepis* specimens.

List of Australian Species and Subspecies

clarki Wheeler
clarki impasta Wheeler
exigua quadrimaculata Forel
lucidula Wheeler
nynganensis McAreavey
squamulosa Wheeler

POLYRHACHIS

Identification

The area above the hind leg is smooth and lacks an opening (the metapleural gland opening) (Fig. 119a). The mandibles have at most seven teeth. The scale of the petiole is upright and has an angular or rounded top which almost always has two or more teeth or strong angles (Figs 127b, 429) (a few species have only weak angles (Fig. 431)). The upper plate of the first segment of the gaster (first gastral tergite) is relatively long and covers more than one-half the total length of the gaster (Fig. 127a). Spines or teeth are usually present on the mesosoma (Figs 127b, 429) but sometimes the mesosoma is smooth (Fig. 431).

Polyrhachis is one of the larger groups of ants in Australia and most species are easily recognised. The majority are black, moderately large (5–10 mm in total length), and have spines or ridges on the mesosoma and spines on the top of the petiole (Figs 127, 429). Some species (in the subgenus *Cyrtomyrma*) differ in having the upper surface of the mesosoma highly arched and lacking spines or angles (Fig. 431). These species, however, have teeth or strong angles present on the top of the petiole (Fig. 431). Additionally, all species of *Polyrhachis* have the first upper plate of the gaster elongate and comprising more than one-half the total length of the gaster (Fig. 127a).

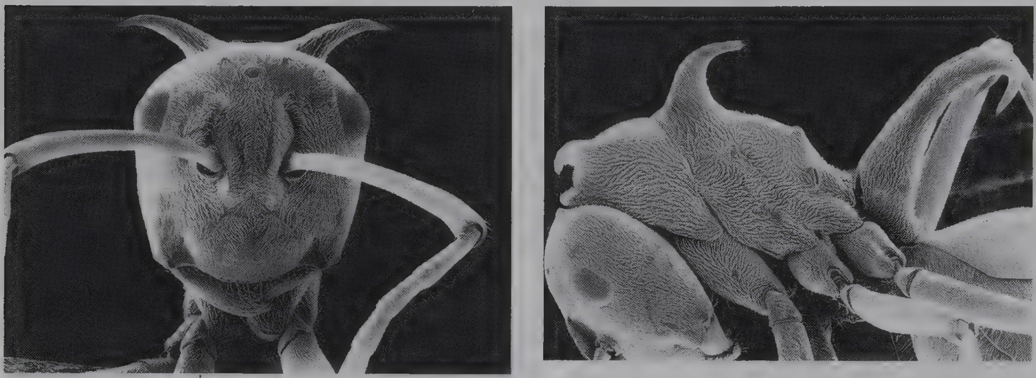
Biology

Polyrhachis is one of the more common groups of ants in Australia. They nest in open soil or in soil under rocks and logs, less commonly they nest in holes in standing trees and a few tropical species form arboreal nests made of plant fibres (carton) and larval silk. Most of the ground-nesting species form inconspicuous nests but at least one of the arid zone species (the mulga ant, *P. macropa)* forms a large mound decorated with dried leaves (Barrett 1927).

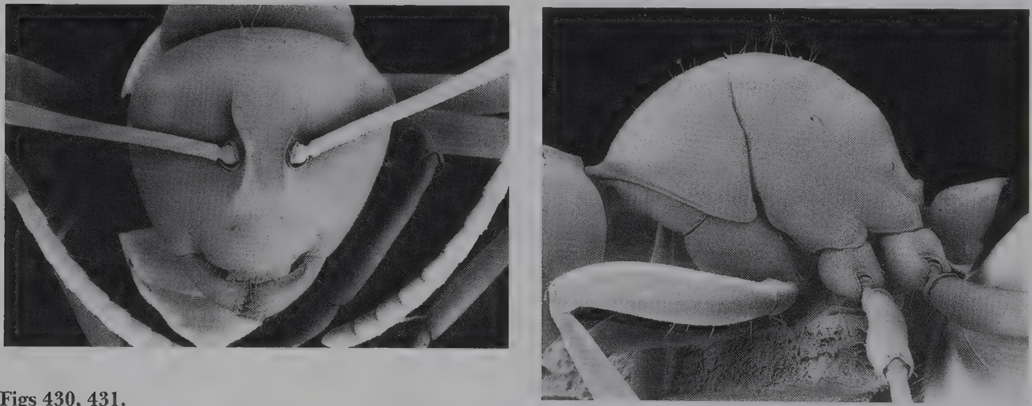
Polyrhachis also contains perhaps the only marine ants in the world. The species *P. constricta* and *P. sokolova* nest in mangrove mud flats which are subject to tidal flooding. They retreat into their nests as the tide advances, foraging in mangroves only during low tide when their nests are exposed.

Polyrhachis is omnivorous and will collect nectar (Briese and Macauley 1981). Most are fairly timid and will retreat when their nests are disturbed. Some of the arboreal species will bang their bodies against the walls of their nests when disturbed, producing a distinct, loud rattling noise. Many species are nocturnal, especially in arid areas, while others will forage during the day.

For details on their taxonomy and biology, see Kohout (1988a, 1988b, 1988c, 1989, 1990) and Kohout and Taylor (1990).



Figs 428, 429.
Polyrhachis (*Polyrhachis*) *bellicosa* Smith worker from 11 km ENE of Mt Tozer, Queensland (head 1.79 mm wide).



Figs 430, 431.
Polyrhachis (*Cytomyrma*) *pilosa* Donisthorpe worker from Perigian Beach, Queensland (head 1.48 mm wide).

Distribution and Habitats

Polyrhachis contains 639 known species and subspecies which are found throughout the tropics of Africa, Asia and the Australian region. Australia has 115 described species and subspecies, which makes *Polyrhachis* the second largest genus in Australia after *Camponotus.* They occur throughout Australia (Fig. 432) in all major habitats.

Fig. 432.
Distribution of *Polyrhachis*.

List of Australian Species and Subspecies

acruata (Le Guillou)
ammon (Fabricius) (= *ammon angustata* Forel)
ammonoeides Roger (= *chalchas* Forel)
andromache Roger (= *hector* Smith, *P. connectens australiae* Emery)
angusta Forel
appendiculata Emery
arcuata (Le Guillou)
argenteosignata Emery
argentosa Forel
atropos Smith (= *eucharis* Karavaiev)
aurea Mayr
australis Mayr (= *nox* Donisthorpe)
bamaga Kohout
barretti Clark
bedoti Forel
bellicosa Smith, 1859
bicolor Smith
cedarensis Forel
cleopatra Forel
clio Forel
clotho Forel
consimillis Smith
constricta Emery
contemta Mayr
crawleyi Forel
creusa Emery (= *creusa chlorizans* Forel, *P. hecuba* Forel)
cupreata Emery (= *daemeli exlex* Forel)
daemeli Mayr
daemeli sulcativentris Emery, 1915
delicata Crawley (= *lysistrata* Santschi)
denticulata Karavaiev
dives Smith (= *exulans* Clark)
doddi Donisthorpe
erato Forel (= *aeschyle* Forel)
eremita Kohout
euterpe Forel
femorata Smith (= *emeryi* Forel)
fervens Smith (= *kershawi* Clark)
flavibasis Clark
foreli Kohout (= *relucens andromache andromeda* Forel)
fuscipes Mayr (= *semipolita hestia* Forel)
gab Forel
glabrinota Clark
gravis Clark
guerini Roger, 1863
heinlethii Forel (= *heinlethii sophiae* Forel)
hermione Emery
hexacantha (Erichson) (= *froggatti* Forel)
hirsuta Mayr (= *hirsuta quinquedentata* Viehmeyer)
hookeri Lowne (= *hookeri aerea* Forel, *P. cataulacoidea* Stitz)
inconspicua Emery (= *thalia* Forel)
insularis Emery (= *inconspicua subnitens* Emery)
inusitata Kohout
io Forel
jacksoniana Roger
lachesis Forel
lata Emery (= *gab aegra* Forel)
latreillei (Guérin-Méneville, 1838)
leae Forel
loweryi Kohout
lownei Forel
lydiae Forel
machaon Santschi

mackayi Donisthorpe
macropa Wheeler (= *longipes* Wheeler)
maculata Forel
micans Mayr
mjobergi Forel (= *anguliceps* Viehmeyer)
mucronata Smith
obscura Forel
obtusa Emery
ops Forel
ornata Mayr (= *humerosa* Emery, *P. chrysothorax* Viehmeyer)
pallescens Mayr (= *aurea depilis* Emery)
patiens Santschi
paxilla Smith
penelope Forel
phryne Forel (= *sempronia* Forel, *sidnica perthensis* Crawley)
pilosa Donisthorpe
polymnia Forel
prometheus Santschi
pseudothrinax Hung
punctiventris Mayr
pyrrhus Forel
queenslandica Emery
rastrellata (Latreille)
reclinata Emery
rowlandi Forel
rufifemur Forel (= *terpsichore elegans* Forel)
rufofemorata Smith
rustica Kohout
schenkii Forel
schoopae Forel
schwiedlandi Forel
semiaurata Mayr
semiobscura Donisthorpe
semipolita André
senilis Forel (= *comata* Crawley, *crawleyella* Santschi, *gab tripellis* Forel)
sexspinosa (Latreille) (= *barnardi* Clark)
sidnica Mayr (= *quadricuspis* Mayr)
sokolova Forel (= *sokolova degener* Forel)
tambourinensis Forel
templi Forel
terpsichore Forel
thais Forel
thusnelda Forel
townsvillei Donisthorpe
trapezoidea Mayr
tubifera Forel
turneri Forel
urania Forel
vermiculosa Mayr
yarrabahensis Forel
yorkana Forel
zimmerae Clark

Prolasius

Identification

The propodeal spiracle is located very close to the rear face of the propodeum when viewed from the side (Figs 150a, 434). The scapes are long and surpass the rear margin of the head by more than three times their maximum diameter (Fig. 152b).

Prolasius is a large, fairly diverse group of ants. They can be separated from other Australian formicines by the relatively compact propodeum, which has a short upper face and a long rear face, and the placement of the propodeal spiracle, which is located very close to the rear margin when viewed from the side (Figs 150, 434). They also have elongate scapes which often exceed the rear margin of the head by one-third their length (Fig. 152b).

Biology

Prolasius workers nest in soil under rocks and logs, or occasionally arboreally. They are most commonly found foraging on the ground or less commonly on tree trunks or low vegetation. Although they have been little studied, some species are known to feed on seeds (Ashton 1979).

Distribution and Habitats

Of a total of 19 known species of *Prolasius*, 18 occur in Australia, with one of these also in Papua New Guinea, and with the remaining species in New Zealand. Within Australia they are

found in forested areas from dry and wet sclerophyll through to rainforests along coastal Queensland, eastern New South Wales, Victoria, Tasmania, south-east South Australia and south-west Western Australia (Fig. 435).

Figs 433, 434.
Prolasius worker from Gerroa, 10 miles S of Kiama, New South Wales (head 0.75 mm wide).

Fig. 435.
Collection sites for *Prolasius* specimens.

List of Australian Species

abruptus Clark
antennatus McAreavey
bruneus McAreavey
clarki McAreavey
convexus McAreavey (= *nigriventris* McAreavey)
depressiceps (Emery)
flavicornis Clark (= *flavidiscus* McAreavey, *flavicornis minor* McAreavey)
formicoides (Forel)
hellenae McAreavey
hemiflavus Clark
mjoebergella (Forel) (= *mjobergi* Forel)
nitidissimus (André) (= *niger* Clark, *depressiceps similis* McAreavey)
pallidus Clark
quadratus McAreavey
reticulatus McAreavey
robustus McAreavey
wheeleri McAreavey
wilsoni McAreavey

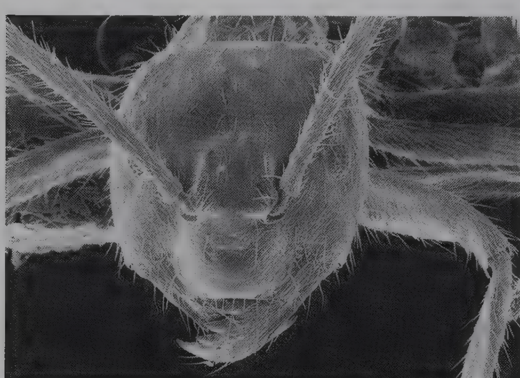
PSEUDOLASIUS

Identification

The eyes are small, in minor workers with five or fewer facets (ommatidia) in their maximum diameter, and are at most only slightly larger than the maximum scape diameter (Figs 436, 438). The outer (maxillary) palps are short, have 2–4 segments and do not extend along the under side of the head (Fig. 144a). Workers are polymorphic and vary considerably in overall size, the largest having very large heads compared with the smallest (compare Figs 436 and 437 with Figs 438 and 439).

Pseudolasius can be distinguished from other Australian formicine ants by their being polymorphic (the workers showing considerable size variation), having small eyes (about the same diameter as the maximum scape diameter) (Figs 436, 438), and having only two, three or four maxillary palp segments (Fig. 144a).

Figs 436, 437.
Psuedolasius major worker from Bulolo, Papua New Guinea (head 2.24 mm wide).



Figs 438, 439.
Psuedolasius minor worker from Bulolo, Papua New Guinea (head 0.82 mm wide).

Biology

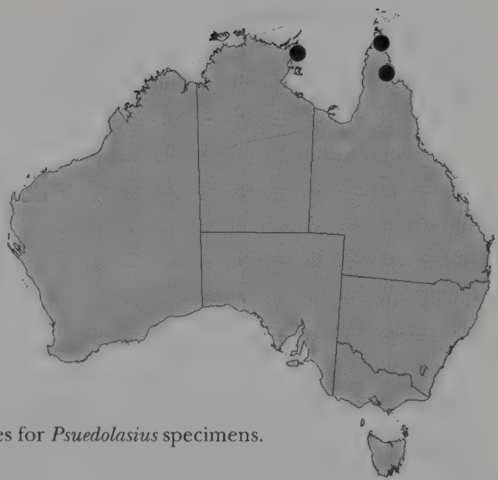
These ants are rarely seen in Australia because of their limited range. They are most often encountered as foragers on the ground and in leaf litter. They are known to attend Hemiptera on the roots of plants.

Distribution and Habitats

The 64 described species and subspecies of *Pseudolasius* occur throughout the tropics of Africa (excluding Madagascar), Asia and the Australian region; only one of these occurs in Australia. An additional species is known from fossil records. Within Australia these ants are limited to rainforests on Cape York Peninsula and the Top End of the Northern Territory (Fig. 440).

List of Australian Species

australis Forel



Fig, 440.
Collection sites for *Psuedolasius* specimens.

PSEUDONOTONCUS

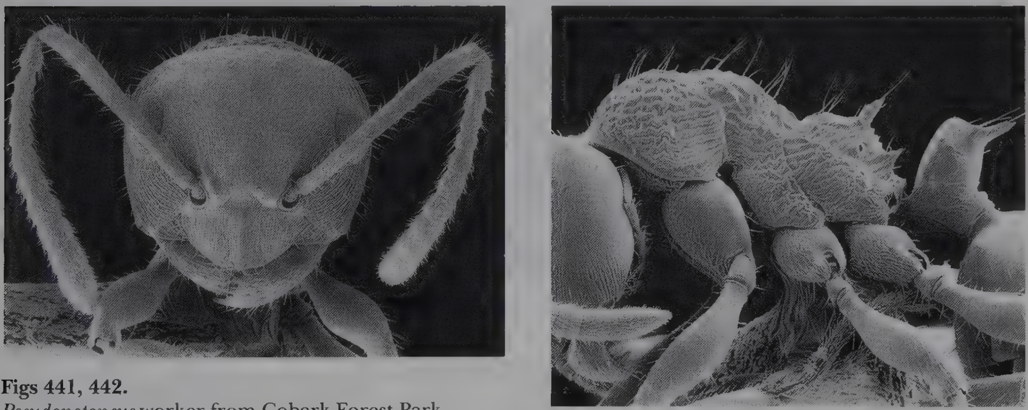
Identification

Two pairs of spines are present on the propodeum and one pair of rearward-directed spines is present on the top of the petiole (Figs 139, 442). The mesosoma is heavily sculptured with distinct ridges (Fig. 442).

Species of *Pseudonotoncus* can be recognised by the spines on the propodeum and petiole (Figs 139, 442). Some species of *Stigmacros* are similar in having spines on the propodeum and the petiole (Figs 111, 445), but they are much smaller in overall size and have 11-segmented antennae (*Pseudonotoncus* has 12-segmented antennae).

Biology

These uncommon ants have been found primarily foraging on vegetation and tree trunks, both during the day and at night. The only known nest was found in soil. Nothing more is known of their biology.



Figs 441, 442.
Pseudonotoncus worker from Cobark Forest Park, Barrington Tops, New South Wales (head 1.10 mm wide).

Distribution and Habitats

This small genus contains only two species and is restricted to Australia, being found along coastal Queensland, New South Wales and Victoria (Fig. 443). They are found in dry sclerophyll woodlands to rainforests.

List of Australian Species

hirsutus Clark
turneri Donisthorpe

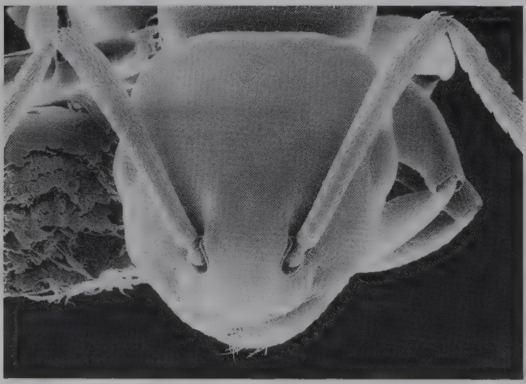
Fig. 443.
Collection sites for *Pseudonotoncus* specimens.

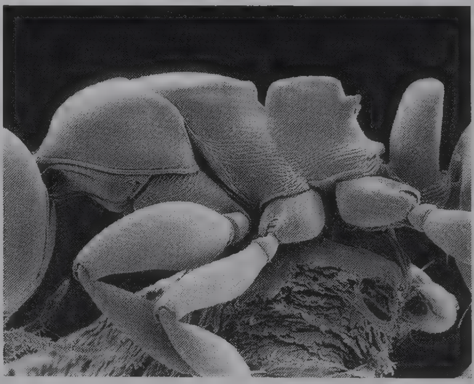
STIGMACROS

Identification

The antennae are 11-segmented (including the scape). The propodeum armed with one or more pairs of spines, teeth or protuberances (Figs 111a, 445). The top of the petiole is usually rounded or angular (Fig. 445), but in some it is armed with a pair of spines (Fig. 111b).

Most species of *Stigmacros* can be recognised by their small overall size and distinct spines on the propodeum (Fig. 445) and top of the petiole (Fig. 111). However, some have the propodeal spines reduced and the top of the petiole rounded (Fig. 445). These ants look very similar to the dolichoderine genus *Ochetellus* or smaller species of *Prolasius* in overall body shape, especially in having the rear face of the propodeum straight or concave. However, *Stigmacros* can be distinguished from these as they have 11-segmented antennae.





Figs 444, 445.
Stigmacros worker from 2 miles W of Mudgee aerodrome, New South Wales (head 0.55 mm wide).

Biology

Stigmacros species are general predators. They forage on the ground, in leaf litter and arboreally on trees and shrubs. Most species nest in the soil, usually under or between rocks, although a few species are known to nest under bark or in dead wood on living trees. They can be relatively common, with four or five species being found together at some sites. For an overview of their taxonomy see McAreavey (1957).

Distribution and Habitats

Stigmacros is known to occur only in Australia. The 48 described species are most abundant and diverse in eastern Queensland, New South Wales, Victoria, Tasmania, south-eastern South Australia and southern Western Australia (Fig. 446). They also occur in arid inland and northern monsoonal regions but here they are much less common. They show a preference for open forested areas (from wet sclerophyll to mallee and *Callitris* woodlands) but are also found in rainforests and savannahs.

Fig. 446.
Collection sites for *Stigmacros* specimens.

List of Australian Species

aciculata McAreavey
acuta McAreavey
aemula (Forel)
anthracina McAreavey
armstrongi McAreavey
australis (Forel)
barretti Santschi
bosii (Forel)
brachytera McAreavey
brevispina McAreavey
brooksi McAreavey
castanea McAreavey
clarki McAreavey
clivispina (Forel)
debilis Bolton (= *foreli* Viehmeyer)
elegans McAreavey
epinotalis McAreavey
extreminigra McAreavey
ferruginea McAreavey
flava McAreavey
flavinodis Clark
fossulata (Viehmeyer)
froggatti (Forel)
glauerti McAreavey
hirsuta McAreavey
impressa McAreavey
inermis McAreavey
intacta (Viehmeyer)
lanaris McAreavey
major McAreavey
marginata McAreavey
medioreticulata (Viehmeyer)
minor McAreavey
nitida McAreavey
occidentalis (Crawley)
pilosella (Viehmeyer)
proxima McAreavey
punctatissima McAreavey
pusilla McAreavey
rectangularis McAreavey
reticulata Clark
rufa McAreavey
sordida McAreavey
spinosa McAreavey
stanleyi McAreavey
striata McAreavey
termitoxena Wheeler
wilsoni McAreavey

Teratomyrmex

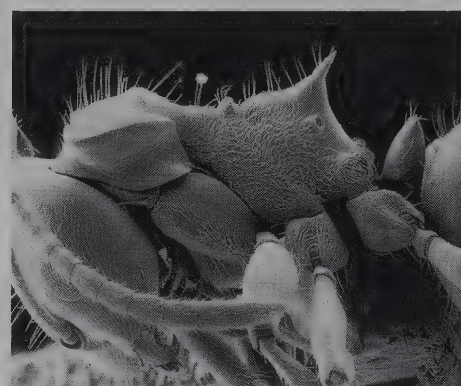
Identification

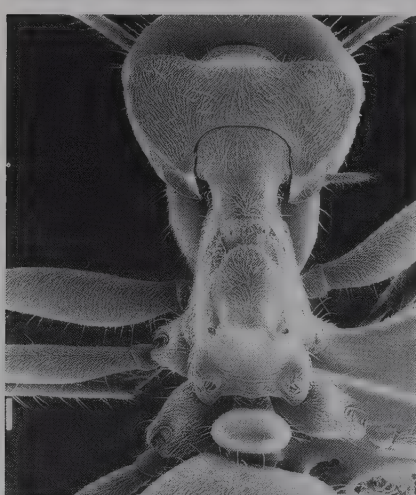
The propodeum has a single pair of spines (Figs 140b, 448). The pronotum is expanded towards the sides into wing-like projections (Figs 141cc, 449).

Teratomyrmex, known from a single species (*T. greavesi*), is immediately recognisable by the unique wing-like expansion of the pronotum (Figs 141cc, 449). No other Australian ant has this pronotal structure.

Biology

These rare ants nest in rotten wood on the ground. They have been collected fewer than a dozen times and essentially nothing is known of the biology.





Figs 447–449.
Teratomyrmex worker from Joalah National Park, Mt Tamborine, Queensland (head 0.83 mm wide).

Fig. 450.
Collection sites for *Teratomyrmex* specimens.

Distribution and Habitats

This genus contains only a single species and is limited to rainforests in south-eastern Queensland and extreme north-eastern New South Wales (Fig. 450).

List of Australian Species

greavesi McAreavey

Onychomyrmex workers tending larvae. Production of brood is highly synchronised so that all larvae are of a similar age (R.W. Taylor).

As with most ants, these *Onychomyrmex* workers are responsible for the care of the eggs, larvae and pupae. They collect newly laid eggs from the queen and ensure their safety as they develop through larvae and pupae (R.W. Taylor).

A foraging worker of *Rhytidoponera.* These workers typically forage singly and are commonly seen in early morning and evening (S.O. Shattuck).

Oecophylla (green tree ant) workers attacking a fly. The fly will be carried to the nest and fed to larvae (P. Zborowski).

Oecophylla (green tree ant) workers are highly predacious and will attack a wide range of arthropods. Working together they can subdue prey many times their own size (P. Zborowski).

An *Oecophylla* (green tree ant) nest constructed of leaves held together by silk produced by their larvae. This nest was the host to a larva of the butterfly *Liphyre* (ANIC Image Library).

A larva of the butterfly *Liphyre.* These larvae are parasitic on ants, living inside their nests and feeding on their brood. Their unusual shape and heavily armored exoskeleton protect them from attack by the ants (ANIC Image Library).

Notoncus workers tending the larvae of the butterfly *Paralucia.* The caterpillars provide the ants with sugary secretions while the ants protect the caterpillars from predators (E.D. Edwards).

Meranoplus workers foraging for seeds and small insects. Their nest entrance (not shown) is only slightly larger than one of these workers (S.O. Shattuck).

Dolichoderus workers clustering on the surface of the ground in the early morning, presumably to warm themselves and their brood. Shortly after this, these ants moved to their permanent underground nest (ANIC Image Library).

Turret entrance above a *Camponotus* nest. It is thought that this type of entrance helps protect the nest from water and predators (S.O. Shattuck).

This type of nest entrance is found in many species of *Camponotus*. It is constructed by adding individual pellets of soil excavated from within the nest to the upper rim of the turret. Frequently disturbed or destroyed, the turret is under constant construction (S.O. Shattuck).

An *Iridomyrmex* (meat ant) nest mound and 'highway'. The mound is covered with small pebbles collected from surrounding areas. The 'highway' leads to a favourite feeding site and is kept clear by the constant parade of ants (ANIC Image Library).

Polyrhachis nest constructed of plant fibres and attached to a tree trunk. This type of nest is found in a limited number of tropical species with most others nesting in the ground (P. Zborowski).

Podomyrma workers, at their nest entrance in a dead branch. Most species nest in similar situations although a few will nest in the ground (P. Zborowski).

Rhytidoponera workers above their nest entrance. These slow moving ants are commonly found in gardens throughout south-eastern Australia (S.O. Shattuck).

Rhytidoponera workers guarding their nest entrance. While smaller species of this genus can give a noticeable sting, this larger species has a weakly developed sting which cannot penetrate human skin (P. Zborowski).

An *Iridomyrmex* (meat ant) returning to its nest with a beetle. These ants, common throughout Australia, can successfully attack prey much larger than themselves and are known to reduce small vertebrates to nothing more than bones in a very short period (D.C.F. Rentz).

Major and minor *Pheidole* workers foraging near their nest. In most cases the larger major workers are outnumbered by the smaller minor workers by at least ten to one (S.O. Shattuck).

A *Polyrhachis* worker foraging on low vegetation. These ants are commonly seen foraging singly on vegetation or the ground (P. Zborowski).

A *Calomyrmex* worker foraging on low vegetation. When disturbed, these ants exude a white to orange coloured fluid from the base of their mandibles to discourage potential predators (P. Zborowski).

A *Polyrhachis* worker foraging on the base of a tree. They are generally timid and will run for cover when disturbed (P. Zborowski).

This *Polyrhachis* is one of only a few ants in Australia which constructs nests by weaving leaves together. The larvae are producing silk which is used to connect individual leaves to form the outer surface of the nest (P. Zborowski).

Workers of *Nothomyrmecia*, one of the world's most primitive living ants, housed in a laboratory nest. In nature these nocturnal ants form small colonies in the soil with small, cryptic entrances (R.W. Taylor).

A large *Myrmecia* nest covered with small twigs and leaves. When disturbed, large numbers of workers will attack with little regard for the size of the intruder (ANIC Image Library).

Myrmecia workers tending brood in a laboratory nest. Soil must be present in these nests to ensure the successful development of the brood as it is required for the proper formation of pupal cocoons (S.O. Shattuck).

Large *Myrmecia* workers generally forage singly on the ground or on low vegetation. They use their well-developed sting to subdue prey which is returned to the nest as food for their larvae (J. Green).

This *Myrmecia* worker has detected a potential predator or prey while foraging. Their acute eyesight enables them to detect large intruders (such as biologists) over a metre away (J. Green).

A single foraging *Myrmecia* worker on low vegetation. Foraging on vegetation is common in these ants (P. Zborowski).

A *Myrmecia* worker carrying its prey, a wasp, to its nest as food for its larvae (C.A. Henley).

These *Camponotus* workers (honey pot ants) were collected from a nest near Alice Springs, Northern Territory. They were found about 1.5 metres below the surface hanging from the ceilings of their nest chambers (D. Rentz).

Ochetellus workers tending Hemiptera on spinifex under coverings constructed of plant resins and soil. These arid-zone ants are susceptible to desiccation and it is thought they construct these coverings to protect themselves and their tended Hemiptera from the dry environment in which they live (S.O. Shattuck).

SUBFAMILY LEPTANILLINAE

Identification

The compound eyes are absent (Figs 39aa, 451). The frontal lobes are always absent so that the bases of the antennae are completely visible where they are inserted into the head when viewed from the front (Figs 39bb, 451). The pronotum and mesonotum are unfused and with a flexible joint between them (Fig. 452). The mesosoma is attached to the gaster by two distinct segments, the petiole and postpetiole (Fig. 452). The overall body size is minute, less than 2.5 mm long, and the colour is pale yellow.

Overview

The subfamily Leptanillae contains seven genera (four of which are only known from males) and 42 described species. They are known from Africa and southern Europe east to Japan and Australia. No species are currently known from North or South America. Only a single species is known from Australia and little is known about its biology.

LEPTANILLA

Identification

Workers of *Leptanilla* are easily recognised by their small size, pale yellow colour, lack of eyes (Figs 39aa, 451) and slender bodies with a two-segmented petiole (Fig. 452). They may be confused with some small myrmicines (ants of the subfamily Myrmicinae). Myrmicines have frontal lobes which are expanded towards the sides of the head and partly or completely cover the bases of the antennae (Fig. 38b), while *Leptanilla* lacks frontal lobes and has the antennae completely visible when viewed from the front (Fig. 39bb). They are also similar to smaller *Aenictus* workers, but differ in being smaller and having 12 segments in the antennae (rather than ten).

Figs 451, 452.
Leptanilla swani Wheeler worker (head 0.21 mm wide).

Biology

Only a single species (*L. swani*) of the subfamily Leptanillinae is known from Australia. It was originally described from a locality near Perth by Wheeler (1932) and its taxonomy has been reviewed by Baroni Urbani (1977).

L. swani is rarely encountered. Workers have been collected only three times while males are more commonly collected, especially in light-traps and Malaise traps. Although essentially nothing is known about the Australian species, other species are known to form colonies of several hundred workers in the soil, to be predacious on small arthropods including centipedes, and to forage largely or exclusively in the soil. Some species form new colonies by fission of established colonies and the queens never possess wings (they are dichthadiform). Some species are known to be nomadic and forage using group-raiding, similar to the army ants. The larvae possess special glands that excrete haemolymph which is then used as a food source by the adults.

Distribution and Habitats

Within Australia, the majority of *Leptanilla* collected have been males captured in traps. They appear to be widespread although most collections are from northern areas and from the Queensland–New South Wales border area, near the coast (Fig. 453). Habitats have ranged from rainforests to dry sclerophyll woodlands and *Casuarina* woodlands. Workers have been collected from the Brisbane area and near Perth.

Fig. 453.
Collection sites for *Leptanilla* specimens.

List of Australian Species

swani Wheeler

SUBFAMILY MYRMECIINAE

Identification

The mesosoma is attached to the gaster by two distinct segments, the petiole and postpetiole (Fig. 455). The mandibles are very long, more or less straight, with teeth along their entire inner margin, and attached near the outer corners of the front margin of the head (Figs 35, 454).

These are some of the largest and most distinctive ants in Australia and are commonly known as bull dog ants and jack jumpers. They are immediately recognisable by their large body size (over 8 mm), large eyes and elongate mandibles (Figs 35, 454). They are unlikely to be confused with any other Australian ants.

Overview

These large, conspicuous ants are most abundant and diverse in southern regions and are rare in the tropics. They are often abundant and can be found in a range of habitats including parks and gardens.

The subfamily contains a single genus (with three additional genera known only from fossils) and its 89 described species and subspecies are limited to Australia, New Caledonia and New Zealand.

MYRMECIA

Identification

All species of *Myrmecia* are large, the smallest being over 6 mm long. Their long, straight mandibles, large eyes (Figs 35, 454) and often bright colours will separate them from all other ants in Australia.

Figs 454, 455.
Myrmecia worker from 19 km SW of Waikerie, South Australia (head 1.98 mm wide (excluding the eyes)).

Biology

Species of *Myrmecia* forage on the ground or on low vegetation, primarily during the day but a few will also forage at night. They collect nectar and plant juices as well as animal prey, the latter being fed to their larvae. Most species nest in soil, often with a mound which is sometimes covered with pebbles or plant fragments. A few species nest in rotten logs and one

northern rainforest species nests arboreally in epiphytic ferns. Most nests are small with only a few hundred workers but some groups commonly have up to a few thousand workers. They are aggressive and have a very potent sting and well-developed vision. They will freely chase intruders away from their nests. The larger species can run rapidly across the ground or through vegetation, while the smaller jack jumpers can cover ground very quickly using a rapid series of short jumps. Several dozen large ants pouring out of a disturbed nest, with jaws open and stings ready and heading straight for the intruder, is more than sufficient to discourage even the most determined collector. Their stings can cause severe allergic reactions in some individuals.

Most species of *Myrmecia* have large, fully winged queens which establish new nests by leaving their parental nests, mating and forming a new nest in a suitable location. However, some species lack this type of queen and have worker-like (ergatoid) queens instead. Other species are temporary social parasites, that is they establish new nests by having a queen invade the established nest of another species, kill its queen and use its workers to raise the brood of the invading queen. One species has lost its worker caste all together and its queens and males are found permanently in the nests of other species. The taxonomy and biology of these diverse ants are discussed by Ogata (1991) and Ogata and Taylor (1991).

Distribution and Habitats

Eighty-eight of the 89 species and subspecies of *Myrmecia* are found in Australia. The remaining species occurs in New Caledonia although it is rare and seldom seen. They are widespread in Australia although they are rare in northern regions (Fig. 456), and are found in a wide range of habitats.

Fig. 456.
Collection sites for *Myrmecia* specimens.

List of Australian Species

aberrans Forel
acuta Ogata and Taylor, 1991
analis Mayr (= *M. atriscapa* Crawley)
arnoldi Clark
athertonensis Forel
auriventris Mayr
borealis Ogata and Taylor
brevinoda Forel (= *M. pyriformis gigas* Forel, *M. forficata eudoxia* Forel, *M. longinodis* Clark, *M. decipians* Clark)
browningi Ogata and Taylor
callima (Clark)
cephalotes (Clark)
chasei Forel (=*M. pilosula mediorubra* Forel)
chrysogaster (Clark)
clarki Crawley
comata Clark
croslandi Taylor
cydista (Clark)
desertorum Wheeler (=*M. lutea* Crawley, *M. princeps* Clark)
dichospila Clark
dimidiata Clark
dispar (Clark)
elegans (Clark)
erecta Ogata and Taylor
esuriens Fabricius (=*M. tasmaniensis* Smith, *M. walkeri* Forel)
eungellensis Ogata and Taylor
exigua (Clark)

fabricii Ogata and Taylor
ferruginea Mayr
flammicollis Brown
flavicoma Roger
forceps Roger (= *M. forceps obscuriceps* Viehmeyer, *M. singularis* Clark)
forficata (Fabricius) (= *M. lucida* Forel, *M. forficata rubra* Forel)
formosa Wheeler (= *M. aberrans haematosticta* Wheeler)
froggatti Forel (= *M. aberrans sericata* Wheeler, *M. aberrans taylori* Wheeler, *M. eupoecila* Clark, *M. greavesi* Clark, *M. excavata* Clark)
fucosa Clark
fulgida Clark (= *M. suttoni* Clark)
fulviculis Forel
fulvipes Roger (= *M. piliventris femorata* Santschi, *M. fulvipes barbata* Wheeler)
fuscipes Clark
gilberti Forel (= *M. regina* Santschi)
gratiosa Clark
gulosa (Fabricius) (=*M. gulosa obscurior* Forel)
harderi Forel (= *M. celaena* Clark, *M. maloni* Clark, *M. scabra* Clark)
hilli (Clark)
hirsuta Clark
infima Forel
inquilina Douglas and Brown
loweryi Ogata and Taylor
ludlowi Crawley
luteiforceps Wheeler, 1933
mandibularis Smith (= *M. mandibularis aureorufa* Forel, *M. mandibularis postpetiolaris* Wheeler, *M. fulvipes coelatinoda* Wheeler, *M. laevinodis* Clark)
maura Wheeler
michaelseni Forel (= *M. michaelseni perthensis* Crawley)
midas Clark
minuscula Forel
mjobergi Forel
nigra Forel
nigriceps Mayr (= *M. fasciata* Clark)
nigriscapa Roger
nigrocincta Smith
nobilis (Clark)
occidentalis (Clark) (= *M. opaca* Clark)
pavida Clark (= *M. atrata* Clark)
petiolata Emery
picta Smith
picticeps Clark
piliventris Smith (= *M. piliventris rectidens* Forel)
pilosula Smith (= *M. ruginoda* Smith)
potteri (Clark)
pulchra Clark (= *M. crassinoda* Clark, *M. fallax* Clark, *M. murina* Clark)
pyriformis Smith (= *M. sanguinea* Smith)
queenslandica Forel (= *M. michaelseni overbecki* Viehmeyer)
regularis Crawley
rowlandi Forel (= *M. tarsata malandensis* Forel, *M. cordata* Clark, *M. cardigaster* Brown)
rubicunda (Clark)
rubripes Clark
rufinodis Smith (= *M. gracilis* Emery)
rugosa Wheeler (= *M. ruginodis* Clark)
simillima Smith (= *M. crudelis* Smith, *M. tricolor* Mayr, *M. spadicea* Mayr, *M. nigriventris* Mayr, *M. affinis* Mayr, *M. paucidens* Forel, *M. tricolor rogeri* Emery)
subfasciata Viehmeyer
swalei Crawley
tarsata Smith
tepperi Emery
testaceipes (Clark) (= *M. dixoni* Clark)
tridentata Ogata and Taylor
urens Lowne (= *M. pumilio* Mayr)
varians Mayr (= *M. goudiei* Clark, M. *marmorata* Clark, *M. rufonigra* Crawley, *M. shepherdi* Clark, *M. wilsoni* Clark)
vindex Smith (= *M. vindex basirufa* Forel)

Identification

The mesosoma is attached to the gaster by two distinct segments, the petiole and postpetiole (Fig. 21aa). The mandibles are generally triangular (Fig. 36aa), but if they are elongate then there are no teeth along the inner margin and they are attached near the middle of the front margin of the head (Fig. 37cc). The eyes are almost always present, conspicuous and with many facets (Fig. 211aa) but are absent in a few species (Fig. 210a). The frontal lobes are always present and expanded towards the sides so they cover the inner part of the antennal bases where they are inserted into the head when viewed from the front (Fig. 38b). The pronotum and mesonotum are fused into a single plate (Fig. 41aa).

Species of myrmicines are most likely to be confused with species of *Leptanilla* or *Tetraponera* because of the two-segmented petiole. However, both *Leptanilla* and *Tetraponera* have the pronotum and mesonotum unfused and with a flexible joint between them (Fig. 40d), while in all myrmicines these two plates are fused into a single structure (Fig. 41aa).

Overview

This is the largest subfamily in Australia, based on both the number of genera and the number of species. Myrmicines range greatly in size, with the smallest about 1 mm long and the largest up to 10 mm. While many species are generalist predators, some specialise on selected soft-bodied invertebrates such as Collembola and others are important seed harvesters. Workers can be found foraging at all times of the day and night, sometimes in large numbers. Nests can be found in almost any suitable location from deep in the soil to the upper branches of trees. Colonies are generally small with a few hundred to a few thousand workers, although some species can have huge nests with many thousands of workers while others form very small nests with fewer than 50 individuals.

Morphologically, these ants are very diverse. Many groups are highly modified with unusual mandibles, elongate spines, elaborate hairs or unique structures not seen in any other ants. Because of this, many genera are relatively easy to identify as they have highly distinctive features which are easily seen (given the appropriate magnification). At the same time, some genera are much less specialised or modified, and separating these from close relatives can be difficult. In these cases, close inspection of subtle differences may be required.

Myrmicines occur throughout the world in all major habitats (except arctic and antarctic regions). They are the largest subfamily of ants with over 6700 species and subspecies and 155 genera. Australia has over 350 species placed in 41 genera, including two genera and many species which are currently undescribed. Eight of the genera are restricted to Australia.

Adlerzia

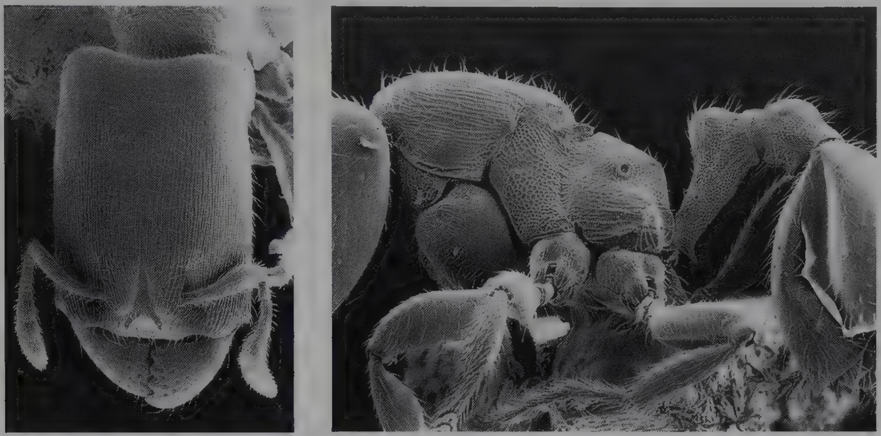
Identification

The antennae are 11-segmented (including the scape). The upper surface of the head is smooth or uniformly sculptured and without grooves for the reception of the antennae when at rest (antennal scrobes are absent) (Figs 221aa, 457, 459). The front margin of the clypeus just above the mandibles has pairs of elongate hairs or setae which straddle the mid-line of the head and lacks a single central hair or seta (Figs 227aa, 457, 459). The clypeus has a pair of longitudinal ridges or sharp angles immediately below the antennal sockets which separate the central region from the lateral regions (clypeus longitudinally bicarinate) (Figs 232a, 457, 459). The petiole has a distinct, rounded node (Figs 458, 460). There are major and minor workers but no intermediates (dimorphic) (compare Figs 457 and 458 with Figs 459 and 460).

These ants are most likely to be confused with species of *Anisopheidole*, *Machomyrma* or possibly *Pheidole* because of the generally similar body size and shape and the presence of major workers. They can be separated by their 11-segmented antennae and bicarinate clypeus (Figs 232a, 457, 459).

Biology

Specimens of *Adlerzia* are infrequently encountered. They nest under stones as well as in the soil without coverings. Little is known about their biology.



Figs 457, 458.
Adlerzia froggatti (Forel) major worker from Lane Cove, Sydney, New South Wales (head 0.95 mm wide and 1.35 mm long).

Figs 459, 460.
Adlerzia froggatti (Forel) minor worker from Lane Cove, Sydney, New South Wales (head 0.67 mm wide and 0.73 mm long).

Distribution and Habitats

Adlerzia contains a single species and is limited to Australia. It is widespread across southern Australia from south-eastern Queensland to southern Western Australia but it is absent from Tasmania (Fig. 461). It is most common in dry sclerophyll woodlands, coastal scrub and mallee, and is less common in wet sclerophyll.

List of Australian Species

froggatti (Forel) (= *silvestrii* Emery, *katerinae* McAreavey)

Fig. 461.
Collection sites for *Adlerzia* specimens.

Anillomyrma

Identification

The eyes are absent (Fig. 210a). The body is small and thin (less than 2.8 mm long) (Fig. 463) and uniform pale yellow in colour.

These small ants are most likely to be confused with species of *Leptanilla* (subfamily Leptanillinae) because of their elongate bodies and lack of eyes. However, the presence of frontal lobes that partially cover the antennal sockets (Fig. 462) will readily separate these ants. They are also similar to workers of *Solenopsis*, but differ from these in having a three-segmented rather than two-segmented antennal club and in the complete lack of eyes (Fig. 210a) (small eyes are present in *Solenopsis*).

Biology

Anillomyrma has been encountered almost exclusively in litter samples and pitfall traps. Because of the lack of eyes and pale colour, it is likely that they are subterranean and spend little time above ground. Nothing is known about their biology.

Figs 462, 463.
Anillomyrma worker from 4.5 km WNW of Pigeon House Mt, New South Wales (head 0.37 mm wide).

Distribution and Habitats

These rare ants are known from southern Africa, Sri Lanka, Vietnam, Borneo and Australia. Within Australia they are found along the east coasts of Queensland and New South Wales, in the ACT, and in southern Victoria and south-west Western Australia (Fig. 464). They occur in wet sclerophyll and rainforests.

List of Australian Species

The species-level taxonomy of these ants in Australia has yet to be examined and no species are presently described.

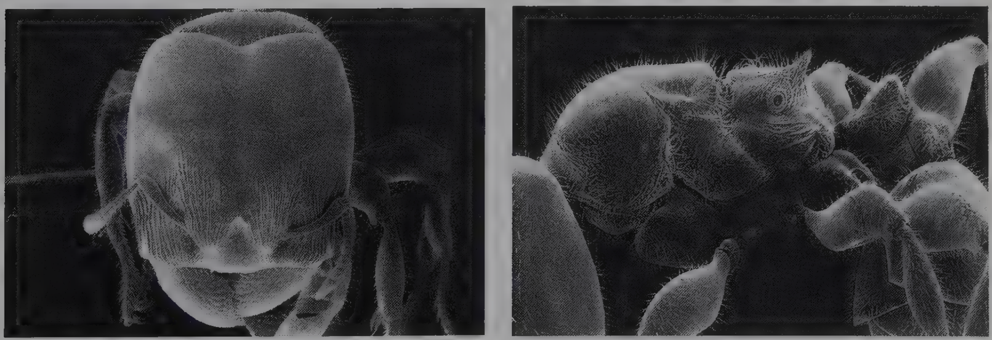
Fig. 464.
Collection sites for *Anillomyrma* specimens.

ANISOPHEIDOLE

Identification

The antennae are 12-segmented (including the scape). The front margin of the clypeus has short to long hairs which straddle the mid-line of the head and lacks a single central hair or seta (Figs 246aa, 465, 467). The eyes are small, with at most five facets (ommatidia) in their greatest diameter (Fig. 269a). The upper surface of the propodeum is approximately even with the pronotum and mesonotum, so that the upper surface of the mesosoma forms a uniform arch interrupted only by the shallow metanotal groove (Figs 466, 468). The size of workers is highly variable between majors and minors (polymorphic) (compare Figs 465 and 466 with Figs 467 and 468).

Anisopheidole is most similar to species of *Adlerzia, Machomyrma* or possibly *Pheidole* because of the generally similar body size and shape and the presence of major workers. They can be separated by their 12-segmented antennae, very small eyes (Fig. 269a), relatively flat upper surface of the mesosoma (Figs 466, 468) and the polymorphic worker caste.



Figs 465, 466.
Anisopheidole antipodum (Smith) major worker from Melrose, near Mt Remarkable, South Australia (head 2.33 mm wide and 2.70 mm long).

Figs 467, 468.
Anisopheidole antipodum (Smith) minor worker from Melrose, near Mt Remarkable, South Australia (head 0.57 mm wide and 0.63 mm long).

Biology

These ants can be locally common, nesting in open soil or under rocks. Although little is known about their biology, they are thought to be specialist predators on termites (Greenslade 1979).

Distribution and Habitats

The genus *Anisopheidole* is limited to Australia. Colonies are found in drier regions ranging from inland New South Wales west to southern Western Australia, with isolated populations in the MacDonnell Ranges near Alice Springs, Northern Territory (Fig. 469). They occur in open sclerophyll woodlands and mallee.

List of Australian Species

antipodum (Smith) (= *froggatti* Forel, *lippulum* Wheeler, *myops* Forel)

Fig. 469.
Collection sites for *Anisopheidole* specimens.

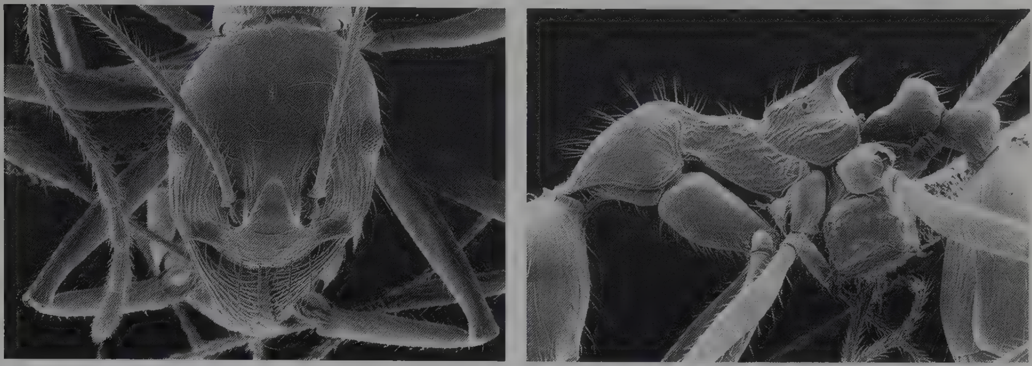
APHAENOGASTER

Identification

Antennae are 12-segmented (including the scape) and have a four-segmented club (Figs 265aa, 470). In side view the propodeum is depressed below the level of the pronotum and forward section of the mesonotum, and these two regions are connected by the steeply sloping rear section of the mesonotum (Figs 262a, 471). All workers from a nest are approximately the same size (monomorphic).

Aphaenogaster is most often confused with *Pheidole* or possibly *Pheidologeton*. They can be separated from *Pheidole* by the four-segmented (Fig. 265aa) rather than three-segmented

(Fig. 264a) antennal club and larger body size (over 3.4 mm long), and from *Pheidologeton* by the 12-segmented antennae (they are 11-segmented in *Pheidologeton*). Additionally, both *Pheidole* and *Pheidologeton* have major and minor workers while *Aphaenogaster* has only a single worker caste.



Figs 470, 471.
Aphaenogaster worker from 3 km NE of Mt Webb, Queensland (head 1.14 mm wide).

Biology

The distinctive nests of these ants are often the first indication of their presence. These nests can be very dense with many large entrances occurring in a small area. Nests are always in soil with or without coverings of stones or other objects. When in sandy soils, individual entrances can be large, deep cones or bores (up to 4 cm in diameter and 30 cm deep) with large mounds of loose dirt. This style of nest has resulted in these ants being known as 'funnel ants'. In some cases these nests can be so dense and extensive that they severely affect soil structure, resulting in a loose and fragile surface which easily collapses under foot. When this occurs in situations such as golf courses, pastures and unsealed airstrips, damage can be severe and these ants can become a serious problem.

When nesting in firm or stony soil, nest entrances are small (just large enough for two or three workers to pass through at the same time) and usually surrounded by low, untidy mounds of loose dirt. Although not aggressive, workers will defend their nests when disturbed. They emerge from entrances in small numbers to attack intruders.

Although nests can contain large numbers of workers, few workers are usually seen on the surface, and then most are found near the entrance; they are rarely seen foraging any distance from nests. It is known that these ants tend aphids on the roots of plants (Saunders 1967) and that arthropod fragments are often found in the upper portions of their nests. It is possible that the tended aphids provide much of the food needed by the nest, and that the funnel-shaped entrances act as traps for surface-foraging arthropods. These factors may combine to reduce or eliminate the need to forage on the surface of the ground. For additional information on these ants see Andersen (1988), Nicholls and McKenzie (1994), Saunders (1967) and Wheeler (1916).

Distribution and Habitats

The 196 known living and 11 fossil species and subspecies of *Aphaenogaster* occur throughout the world with the exception of South America and southern Africa. Within Australia they are found widely in eastern and southern areas, except Tasmania, with isolated populations in the Top End and the Kimberley region (Fig. 472). They occur in a range of habitats from rainforests to mallee.

List of Australian Species

barbigula Wheeler
longiceps (Smith) (= *longiceps ruginota* Forel)
poultoni Crawley
pythia Forel

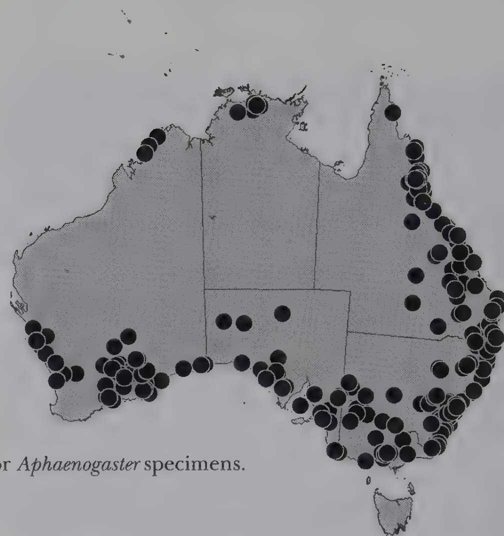


Fig. 472.
Collection sites for *Aphaenogaster* specimens.

CALYPTOMYRMEX

Identification

Distinct, elongate depressions (antennal scrobes) are present on the front of the head which contain the entire antennae when at rest (Figs 237, 473). The front margin of the clypeus has a conspicuous, broad, bilobed appendage (the clypeal fork) which projects over the rear section of the mandibles (Figs 237a, 238a, 473).

The deep antennal scrobes and the unique configuration of the clypeus will separate these ants from all others in Australia.

Figs 473, 474.
Calyptomyrmex worker from 2 km WNW of Cape Tribulation, Queensland (head 0.73 mm wide).

Biology

These rare ants are most often encountered as ground foragers or in leaf litter collected from the ground surface. The few nests which have been found have been in rotten wood. While they are seldom seen in Australia, they are more common in Papua New Guinea and the Philippines.

Distribution and Habitats

The 24 known species of *Calyptomyrmex* occur throughout the tropics of Africa, Asia and the Australian region. Within Australia they are limited to rainforests of north-coastal Queensland (Fig. 475).

List of Australian Species

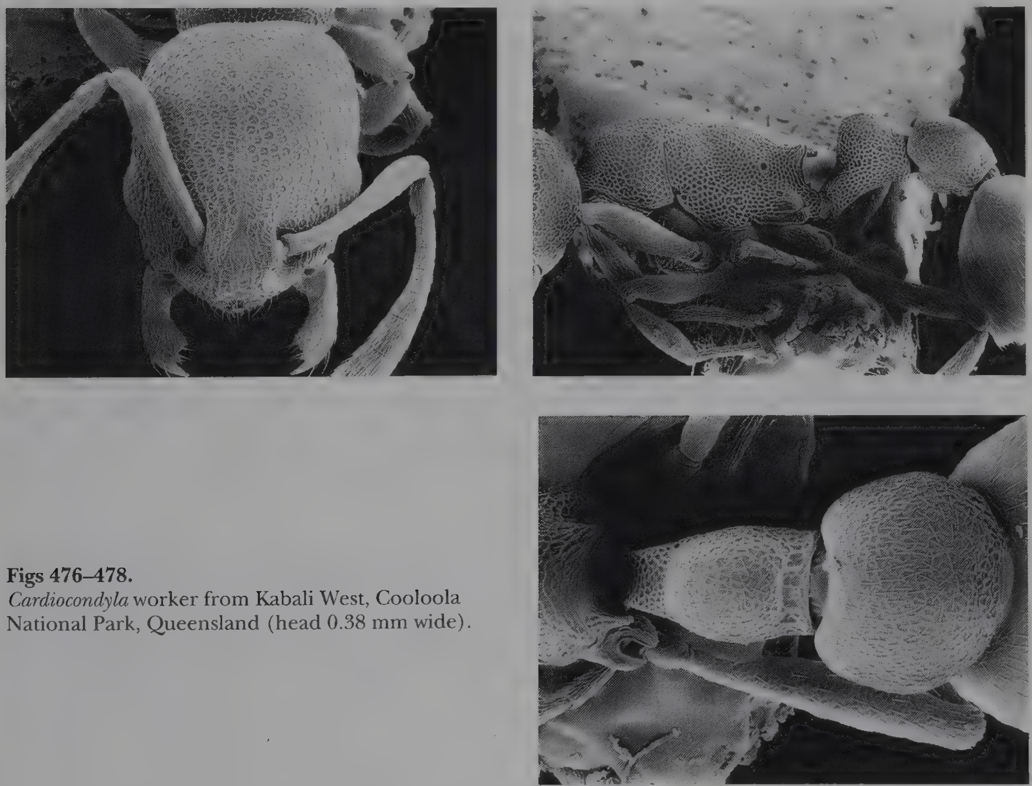
beccarii Emery (= *schraderi* Forel)

Fig. 475.
Collection sites for *Calyptomyrmex* specimens.

CARDIOCONDYLA

Identification

In side view the pronotum, mesonotum and propodeum form a continuous flat to weakly arched surface which is interrupted only by the shallow metanotal groove (Fig. 477). The propodeum is armed with short and triangular (Fig. 477) to long and thin spines. The postpetiole is swollen, wider than long and much broader than the petiole when viewed from above (Figs 247a, 478). The combination of these characters will separate these ants from all others.



Figs 476–478.
Cardiocondyla worker from Kabali West, Cooloola National Park, Queensland (head 0.38 mm wide).

Biology

Cardiocondyla species are ground nesting and most workers also forage on the ground surface. They are only occasionally found foraging arboreally. Because of their small size and habit of moving slowly, they are often overlooked during casual collecting. Several species are well-known pests in tropical regions throughout the world. While these same species occur in Australia, they are often found in remote areas and it is unclear whether they are native or introduced.

The males of some *Cardocondyla* are unusual. In most ants, males are fully winged. However, in these species the males are wingless and worker-like (Heinze, Kühnholz, Schilder and Hölldobler 1993).

Distribution and Habitats

Cardiocondyla contains 49 known species and subspecies which are found throughout the world. They are widespread along the western, northern and eastern coasts of Australia, as well as throughout New South Wales, northern South Australia and southern Northern Territory (Fig. 479). They can be found in a wide range of habitats from rainforests to grasslands, although they are most common in wooded areas. They also occur in disturbed areas such as towns and cities.

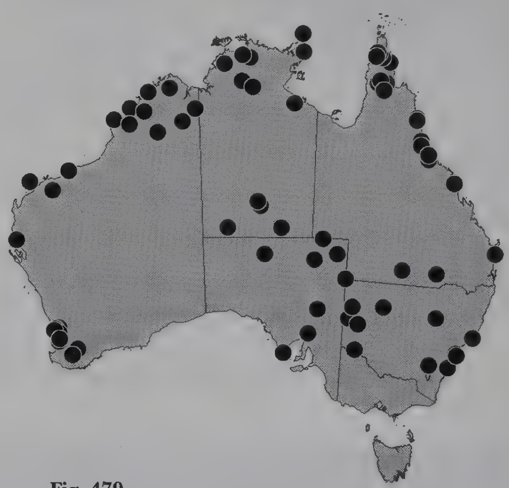


Fig. 479.
Collection sites for *Cardiocondyla* specimens.

List of Australian Species

emeryi Forel (= *nuda nereis* Wheeler)
nuda (Mayr) (= *nuda atalanta* Forel)
thoracica (Smith)
wroughtonii (Forel)

Colobostruma

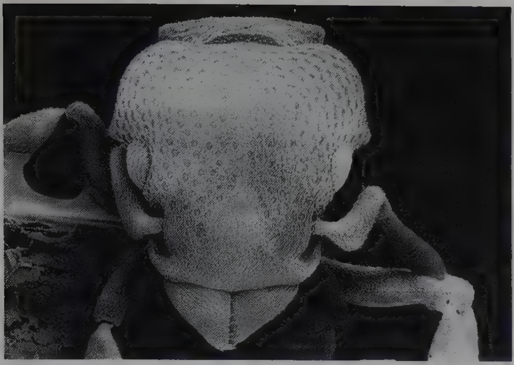
Identification

The antennae have 4–6 segments (including the scape) (Fig. 161a). The petiole and postpetiole have thin, wing-like flanges extending outwards from their sides (best viewed from above) (Figs 167a, 482).

Workers of *Colobostruma* are most similar to workers of *Mesostruma*. They differ in that *Colobostruma* has wing-like flanges on both the petiole and postpetiole (Figs 167a, 482) while the flanges are limited to the postpetiole in *Mesostruma* (Figs 168aa, 516).

Biology

These ants can be locally common although they are often overlooked. Most species have small colonies with less than 100 workers, and workers will lie motionless when disturbed. Nests are in soil usually under rocks, in cracks in rocks or in rotten logs. Only a single north Queensland rainforest species is known to nest arboreally. Foraging is usually on the ground at night, but occasionally they are found foraging on mallee. They are also commonly found in leaf litter.



Figs 480–482.
Colobostruma worker from Upper Allyn River, New South Wales (head 0.78 mm wide).

Distribution and Habitats

Eight of the nine described species of *Colobostruma* occur in Australia, with the remaining species found in Papua New Guinea and the Solomon Islands. Within Australia this genus is found along the east coast of Queensland, eastern New South Wales, Victoria, Tasmania and southern South Australia and Western Australia (Fig. 483). They are found in rainforests and wet sclerophyll forests through to coastal heath and moist dry sclerophyll, mallee and grassland sites.

Fig. 483.
Collection sites for *Colobostruma* specimens.

List of Australian Species

alinodis (Forel)
australis Brown
cerornata Brown
elliotti (Clark)
froggatti (Forel)
leae (Wheeler)
nancyae Brown
papulata Brown

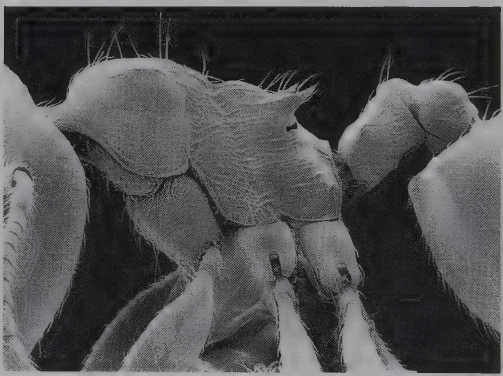
Crematogaster

Identification

The antennae are 11-segmented (including the scape). The petiole is low and rounded and lacks a node on its upper surface (Figs 183b, 485). The postpetiole is attached to the upper surface of the gaster (Figs 183a, 485). The nature of the attachment of the postpetiole to the gaster is highly distinctive and will separate these ants from all others.

Biology

Crematogaster is one of the most common groups of ants in Australia and is regularly encountered, often in large numbers. Workers are moderately aggressive and will attack when disturbed. They have well-developed chemical defences and are avoided by most other ants. Nests are found in a range of sites including in soil with or without coverings, in cracks in rocks, and arboreally in trunks and twigs. Nests can contain many thousands of workers but most are more moderately sized. Individual colonies are often composed of several small nests a few metres apart. The entrances of these separate nests can sometimes be connected by well-worn trails several centimetres deep. Additionally, some ground-nesting species will form small satellite nests under bark on trees to protect and guard the Hemiptera from which they collect honeydew. Foraging takes place on the ground as well as on low vegetation and trees, and often involves distinct trails. They are thought to be generalist predators as well as tending Hemiptera and the caterpillars of several butterflies.



Figs 484, 485.
Crematogaster worker from slopes above Baroalba Spring, Northern Territory (head 0.77 mm wide).

Distribution and Habitats

The 806 described species and subspecies (with an additional two species known from fossil records) occur throughout the world. They are found everywhere in Australia including Flinders Island but not the Tasmanian mainland (Fig. 486), and frequent all habitats, including mangroves.

Fig. 486.
Distribution of *Crematogaster*.

List of Australian Species and Subspecies

australis Mayr
australis chillagoensis Forel
australis sycites Forel
cornigera Forel
dispar Forel
dispar bipartita Emery
eurydice Forel
frivola Forel
frivola sculpticeps Forel
fusca Mayr
kutteri Viehmeyer
laeviceps Smith
laeviceps broomensis Forel
laeviceps chasei Forel
laeviceps clarior Forel
longiceps Forel
longiceps curticeps Wheeler
mjobergi Forel
pallida Lowne
pallipes Mayr (= *piceus* Lowne, *pallidipes* Dalla Torre)
perthensis Crawley
pythia Forel
queenslandica Forel
queenslandica froggatti Forel
queenslandica gilberti Emery
queenslandica rogans Forel
queenslandica scabrula Emery
rufotestacea Mayr
rufotestacea dentinasis Santschi
scita Forel
scita mixta Forel
whitei Wheeler
xerophila Wheeler
xerophila exigua Wheeler

DILOBOCONDYLA

Identification

The rear corners of the head form sharp angles or points (best viewed from the front) (Figs 258a, 487). Weak but distinct grooves (antennal scrobes) are present on the front of the head for the reception of the antennae when at rest (Figs 258b, 487). The node of the petiole is very low and rounded, so much so that it is almost absent (Figs 260d, 488). The shape of the head and petiolar node will separate these ants from all others in Australia.

Biology

These ants are very rare in Australia, having been collected only twice. The single Australian species is likely to be arboreal, forming small colonies in twigs, an observation based on species occurring Papua New Guinea and the Philippines. Their taxonomy is discussed by Taylor (1991b).

Figs 487, 488.
Dilobocondyla worker from Lockerbie Scrub, Cape York, Queensland (head 1.00 mm wide).

Distribution and Habitats

The 11 known species and subspecies of *Dilobocondyla* extend from Sri Lanka east through Vietnam and south into Indonesia and Australia. Within Australia they are limited to rainforests of extreme northern Cape York Peninsula, Queensland (Fig. 489).

List of Australian Species

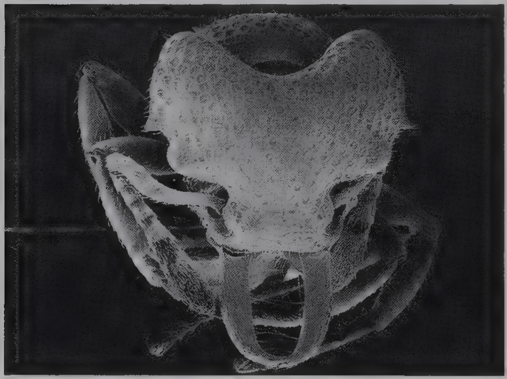
cataulacoidea (Stitz) (= *catalaucoidea concolor* Viehmeyer)

Fig. 489.
Collection sites for *Dilobocondyla* specimens.

Epopostruma

Identification

The antennae are six-segmented (including the scape) and the scapes pass below the eyes when laid back against the head in their normal resting position (Figs 161a, 490). The mandibles are thin and elongate and when fully closed they are separated by a broad gap for most of their length, touching only at the tips (Figs 165a, 490). These characters will separate *Epopostruma* from all other Australian ants, including the superficially similar *Colobostruma, Eurhopalothrix, Mesostruma* and *Rhopalothrix.*



Figs 490–492.
Epopostruma worker from New Norcia, Western Australia (head 1.36 mm wide).

Biology

While *Epopostruma* is fairly common, species are often overlooked. Workers are slow-moving and most lie motionless when disturbed. Their nests are small, with up to about 100 workers, and are found in open soil or in soil under rocks, logs or small sticks. They also nest in cracks in large rocks. When nesting in open soil they are often found near the base of trees.
Almost all species forage at night although one species is known to occasionally forage on mallee stems during the day. They are also regularly found in leaf litter. Workers have been attracted to honey baits on trees in the late evening and at night. Their elongate and specialised mandibles form a type of snap-trap which is used to captured soft-bodied prey such as Collembola.

Distribution and Habitats

These ants are limited to Australia where they occur along the east coast of Queensland (although infrequently), through eastern New South Wales, Victoria, Tasmania, southern South Australia and southern Western Australia (Fig. 493). There is also a single collection (of a single worker) from the Kimberley district of northern Western Australia, which was found foraging in riparian woodland near a *Papyrius* colony. They frequent a range of habitats, including wet sclerophyll, riparian woodlands and coastal scrub through dry sclerophyll, savannah woodlands and mallee.

Fig. 493.
Collection sites for *Epopostruma* specimens.

List of Australian Species

frosti (Brown)
monstrosa Viehmeyer
quadrispinosa (Forel) (= *quadrispinosa ferruginea* Forel)

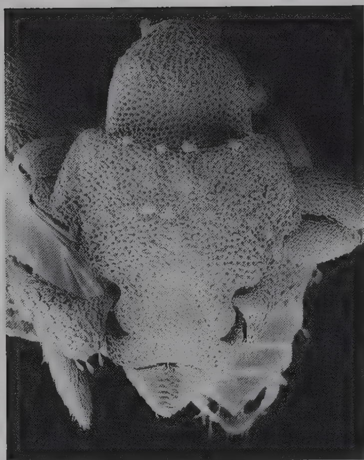
EURHOPALOTHRIX

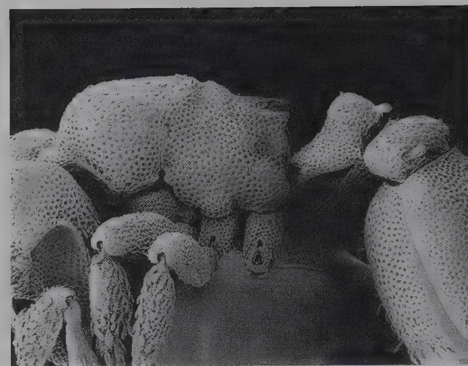
Identification

The antennae are seven-segmented (including the scape) and when laid back against the head in their normal resting position are held in distinct, elongate depressions (antennal scrobes) which pass below the eyes (Fig. 162aa). The mandibles are triangular and when fully closed they touch or nearly touch along their entire length (Figs 170aa, 494). These ants are most similar to *Rhopalothrix*, but differ in having triangular (Figs 170aa, 494) rather than thin, elongate (Figs 169a, 569) mandibles.

Biology

These ants are infrequently encountered although they can be locally common. They are most often found in leaf litter samples. Nests are in soil under rocks or in cracks in rocks and can be quite large. Although detailed studies have not been undertaken in Australia, a species of *Eurhopalothrix* from Papua New Guinea has been found to accept a wide range of soft-bodied arthropods with a preference for collembolans (Wilson 1956). For additional information see Taylor (1980b).





Figs 494, 495.
Eurhopalothrix australis Brown and Kempf worker from Kiwarrak State Forest, 11 km S of Taree, New South Wales (head 0.60 mm wide).

Distribution and Habitats

Eurhopalothrix contains 35 known species. They are found in Central and South America, and from Malaysia and the Philippines south through Indonesia and into Australia. Within Australia they occur in rainforests and other wet sites along the east coast of Queensland and extreme north-eastern New South Wales (Fig. 496).

Fig. 496.
Collection sites for *Eurhopalothrix* specimens.

List of Australian Species

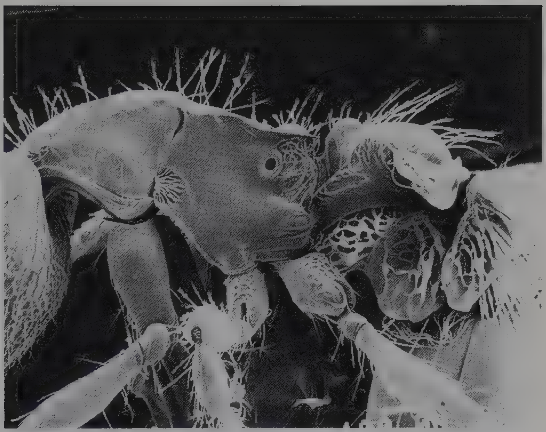
australis Brown and Kempf
procera (Emery)

GLAMYROMYRMEX

Identification

The antennae are 6-segmented (including the scape) (Fig. 175). The mandibles are short and triangular and with eight or more teeth along their entire inner margins (Figs 171a, 497). The rear face of the propodeum has a pair of elongate, vertical flanges (Figs 173a, 498). The sides of the petiole and postpetiole and the lower part of the gaster have masses of sponge-like cuticle (Fig. 498).

These ants are recognisable by the highly modified head shape (Fig. 497) and the sponge-like structures on the petiole, postpetiole and gaster (Fig. 498). They differ from other ants with these characters (*Quadristruma, Strumigenys* and *Trichoscapa*) by having triangular mandibles (Figs 171a, 497) and elongate, vertical flanges on the propodeum (Figs 173a, 498).



Figs 497, 498.
Glamyromyrmex worker from Mt Cook National Park, Queensland (head 0.44 mm wide).

Biology

These small, predacious ants have been encountered almost exclusively in leaf litter. An exception is a worker taken as prey by green tree ants (genus *Oecophylla*) and found in their nest in Darwin. Nothing is known about the biology of the Australian species, although their taxonomy is currently being reviewed by B. Bolton.

Distribution and Habitats

The 21 known species of *Glamyromyrmex* occur in tropical regions of Central and South America and Africa, as well as Australia and Papua New Guinea. Within Australia, the five known species (three of which are undescribed) are limited to rainforests along the east coast of Queensland and in savannah woodlands in the Top End (Fig. 499).

List of Australian Species

flagellatus (Taylor)
semicomptus (Brown)

Fig. 499.
Collection sites for *Glamyromyrmex* specimens.

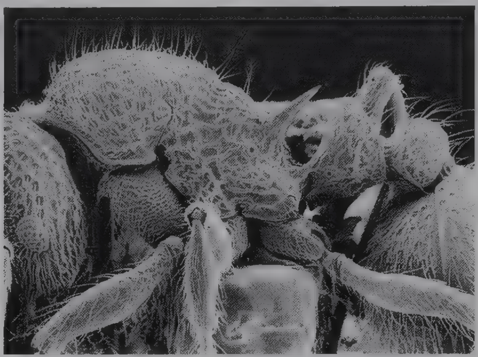
LORDOMYRMA

Identification

The antennae are 12-segmented (including the scape). The upper surface of the head with (northern species) (Figs 272aa, 500) or without (southern species) grooves or depressions (antennal scrobes) for the reception of the antennae when at rest. The eyes are large, have eight or more facets (ommatidia) in their greatest diameter and are distinctly oval or elongate (Fig. 270aa). The area of the clypeus immediately below the antennal sockets is smooth and

rounded (Figs 272, 500). The mandibles have 6–10 teeth (Fig. 272bb). The upper surface of the propodeum is approximately even with the pronotum and mesonotum so that the upper surface of the mesosoma forms a uniform arch interrupted only by the shallow metanotal groove (Figs 263aa, 501). The tip of the sting is a thin, sharp point (visible only when the sting is extended) (Fig. 274cc).

The characters listed above will separate these ants from others in Australia. They are superficially most similar to workers in Unnamed Genus #2, but have more teeth in the mandibles and a sharply pointed sting.



Figs 500, 501.
Lordomyrma worker from Mt Lewis, Queensland (head 0.68 mm wide).

Biology

Workers of *Lordomyrma* are most often encountered in leaf litter or while foraging on vegetation. In northern areas they nest in rotten logs while in southern, drier localities they nest in soil or under small rocks. The few colonies which have been collected have been small, with less than 100 workers in total. They are slow moving and timid when disturbed.

Distribution and Habitats

There are 20 known species and subspecies of *Lordomyrma,* which occur from Japan south into New Guinea and Australia and east to New Caledonia and Fiji. Within Australia they are limited to coastal Queensland and northern New South Wales (Fig. 502). In northern regions they are limited to rainforests while in southern areas they extend into dry sclerophyll.

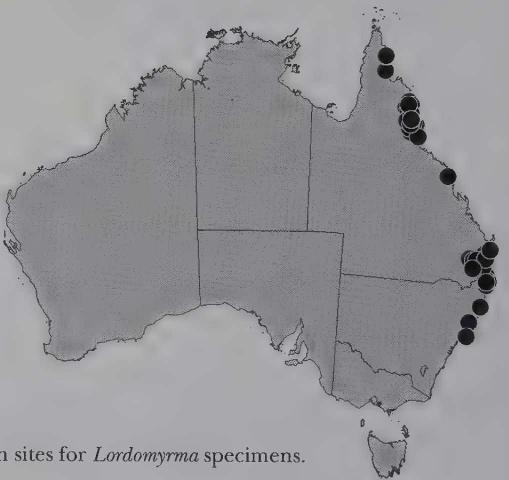


Fig. 502.
Collection sites for *Lordomyrma* specimens.

List of Australian Species

leae Wheeler
punctiventris Wheeler

MACHOMYRMA

Identification

The antennae are 11-segmented (including the scape). The upper surface of the head is smooth or uniformly sculptured and lacks grooves for the reception of the antennae when at rest (antennal scrobes are absent) (Figs 233a, 503, 505). The front margin of the clypeus just above the mandibles has pairs of elongate hairs or setae which straddle the mid-line of the head and lacks a single central hair or seta (Figs 503, 504). The clypeus is smooth or has weak, scattered sculpturing across its entire width (Figs 233a, 503, 505). The petiole has a distinct, rounded node (Figs 235, 236, 504, 506). There are major and minor workers but no intermediates (dimorphic) (compare Figs 503 and 504 with Figs 505 and 506).

These ants are most likely to be confused with species of *Adlerzia, Anisopheidole* or possibly *Pheidole* because of the generally similar body size and shape and the presence of major workers. They can be separated by their 11-segmented antennae and smooth clypeus which lacks a pair of longitudinal ridges near its centre (Figs 233a, 503, 505).

Biology

These rare ants are infrequently encountered. They nest in soil under or between rocks. Little else is known of their biology.

Figs 503, 504.
Machomyrma dispar (Forel) major worker from Glenugie State Forest, 15 miles S of Grafton, New South Wales (head 0.82 mm wide and 1.23 mm long).

Figs 505, 506.
Machomyrma dispar (Forel) minor worker from Numinbah Natural Arch, Queensland (head 0.42 mm wide and 0.50 mm long).

Distribution and Habitats

The single described species of *Machomyrma* is only known from Australia. They have been found in a wide range of localities and habitats, ranging from open savannah in the Kimberley region of northern Western Australia, to rainforests along the east coast of Queensland and mallee in central New South Wales (Fig. 507).

List of Australian Species

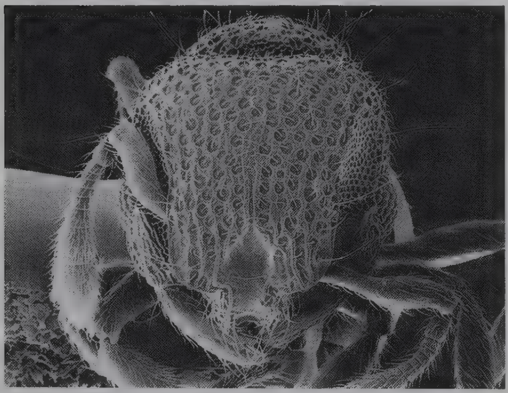
dispar (Forel)

Fig. 507.
Collection sites for *Machomyrma* specimens.

MAYRIELLA

Identification

The antennae are ten-segmented (including the scape) and have a two-segmented club (similar to Fig. 186a, which has only nine segments). The upper surface of the head has a pair of narrow and deep grooves (antennal scrobes) which contain the entire antennae when at rest (Figs 196a, 508). The front margin of the clypeus is armed with a pair of sharp teeth just above the mandibles (Fig. 508). The eyes are elongate and the lower section narrows into a point (Figs 196b, 509). The shape of the eyes combined with the ten-segmented antennae and the deep antennal scrobes will allow ready identification of these ants.



Figs 508, 509.
Mayriella overbecki Viehmeyer worker from Kanangra-Boyd National Park, New South Wales (head 0.52 mm wide).

Biology

Mayriella is nowhere common although it tends to be patchily distributed and can be locally abundant. The small workers move slowly and may lie motionless when disturbed, thus causing them to be frequently overlooked. Nests are located in soil under stones or in the

open with a small mound of loose dirt at the entrance. They also nest in rotten logs. The number of workers in nests averages between 50 and 100, and many nests contain several queens. Foraging workers are commonly collected from litter samples. Their biology and taxonomy was examined by Wheeler (1935).

Distribution and Habitats

Mayriella contains five described species with several undescribed species awaiting study. They range from Nepal through South-east Asia into Papua New Guinea and Australia. Within Australia they occur along the east coast of Queensland, New South Wales, Victoria and south-east South Australia, with a single record from north-eastern Tasmania (Fig. 510). One of the Australian species has been introduced into New Zealand. They show a strong preference for wet sclerophyll, coastal scrub and rainforests although they are occasionally found in dry sclerophyll, especially in southern regions.

Fig. 510.
Collection sites for *Mayriella* specimens.

List of Australian Species

abstinens Forel
hackeri Wheeler
overbecki Viehmeyer
spinosior Wheeler
venustula Wheeler

MERANOPLUS

Identification

The antennae are nine-segmented (including the scape). The upper surface of the mesosoma forms a broad shield with thin, sharp lateral edges which project outwards over the sides of the mesosoma (Figs 181a, 512, 513). The shield-like upper surface of the mesosoma will separate these ants from all others.

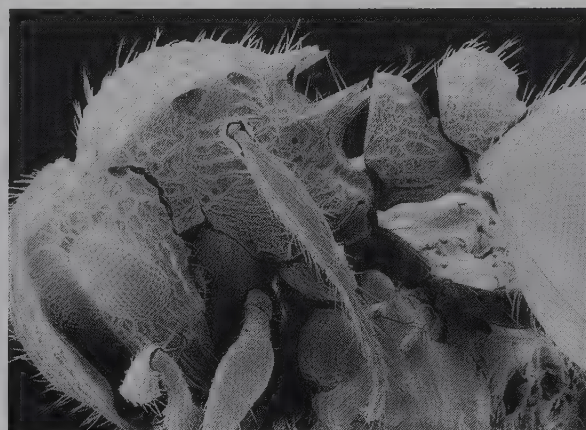
Biology

These common ants form ground nests, with or without covering, sometimes with a mound of low dirt or a large depression around the entrance, and often with piles of discarded seeds or seed coats near or around the entrance. Workers are slow moving, foraging on the ground and occasionally on tree trunks, primarily during the day but also at night. When disturbed many species will retract their legs and curl their gasters under themselves to form a compact ball, and lie motionless to avoid detection. While most species are generalist scavengers, some specialise on seeds. They are also attracted to tuna baits as well as honey baits on trees.

Distribution and Habitats

Meranoplus contains 59 described species and subspecies although there are many yet to be described. They occur from Africa east through India and south into Indonesia, New Guinea,

Australia and New Caledonia. They occur throughout Australia (Fig. 514) although they are most abundant in coastal heath, dry sclerophyll, mallee and arid regions and are less common and diverse in cool areas, wet sclerophyll woodlands and rainforests.



Figs 511–513.
Meranoplus worker from Mt Magnet area, Western Australia (head 0.69 mm wide (excluding the eyes)).

Fig. 514.
Distribution of *Meranoplus*.

List of Australian Species

ajax Forel
aureolus Crawley
barretti Santschi
dichrous Forel
dimidiatus Smith
diversus Smith
doddi Santschi
duyfkeni Forel
excavatus Clark
fenestratus Smith
ferrugineus Crawley
froggatti Forel
hilli Crawley
hirsutus Mayr
hospes Forel

linae Santschi
mars Forel
minimus Crawley (= *crawleyi* Viehmeyer, *minor* Crawley)
minor Forel
mjobergi Forel
oceanicus Smith
oxleyi Forel
pubescens (Smith)
puryi Forel (= *puryi curvispina* Forel)
rugosus Crawley
similis Viehmeyer
testudineus McAreavey
unicolor Forel

MESOSTRUMA

Identification

The antennae are six-segmented (including the scape) (Fig. 161a). The sides of the petiole are rounded, while the sides of the postpetiole are armed with thin, wing-like flanges (best viewed from above) (Figs 168aa, 516).

Workers of *Mesostruma* are most similar to workers of *Colobostruma*. They differ in that *Mesostruma* has wing-like flanges only on the postpetiole (Figs 168aa, 516) while flanges are present on both the petiole and postpetiole in *Colobostruma* (Figs 167a, 482).

Biology

These uncommon ants form small colonies in the soil, usually under or between rocks. They forage primarily on the ground in leaf litter but can occasionally be found on low vegetation. Their taxonomy and biology has been reviewed by Taylor (1973).

Figs 515, 516.
Mesostruma eccentrica Taylor worker from 10 km S of New Norcia, Western Australia (head 0.72 mm wide).

Distribution and Habitats

These ants are limited to Australia. They occur in wet sclerophyll along the east coast of southern Queensland and New South Wales, and in higher rainfall mallee areas of western Victoria (including a mallee outlier near Melbourne) and south-eastern South Australia (Fig. 517). In southern Western Australia they extend from sand plains along the south-eastern coast through to mallee north of Perth.

List of Australian Species

browni Taylor
eccentrica Taylor
exolympica Taylor
laevigata Brown
loweryi Taylor
turneri (Forel)

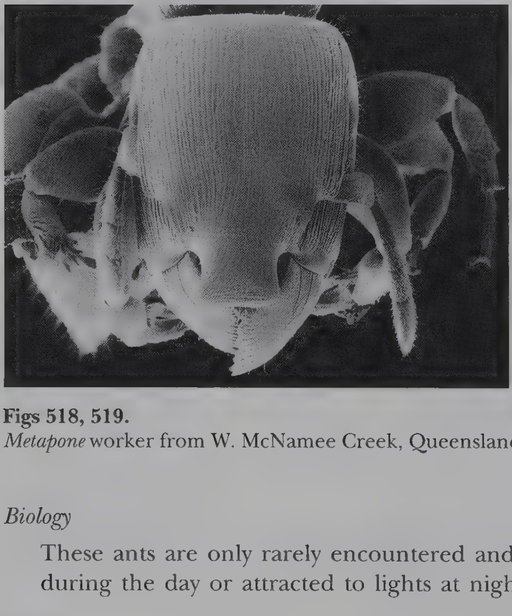
Fig. 517.
Collection sites for *Mesostruma* specimens.

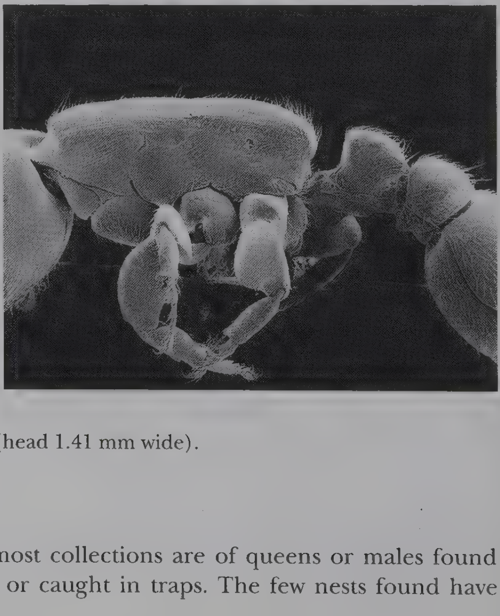
METAPONE

Identification

The antennae are 11-segmented (including the scape) and have a flattened, three-segmented club (Fig. 518). The scapes are broad and flat and fitting into deep, narrow grooves (antennal scrobes) on the upper surface of the head (Figs 222a, 223a, 518). The eyes are very small (Fig. 223b). The petiole and postpetiole are large and block-like and the postpetiole is attached to the gaster along its entire rear face (Figs 223d, 519). The body is elongate with very short, thick legs (Figs 223, 519). These characters will immediately separate *Metapone* from all other myrmicines (species in the subfamily Myrmicinae).

Metapone may be confused with species in the subfamily Ponerinae because of the broad attachment of the postpetiole to the gaster and the overall elongate body (Fig. 519). However, the shape of the head and antennae (Figs 222, 518), and details of the configuration of the petiole and postpetiole, indicate that *Metapone* is a highly adapted and modified myrmicine rather than a ponerine.





Figs 518, 519.
Metapone worker from W. McNamee Creek, Queensland (head 1.41 mm wide).

Biology

These ants are only rarely encountered and most collections are of queens or males found during the day or attracted to lights at night, or caught in traps. The few nests found have

been in the centres of large, solid logs on the ground, apparently in chambers originally established by termites. They are often associated with termites on which they are believed to be specialist predators. Such specialised feeding habits are suggested by the highly modified and unusual body shape of these ants.

The taxonomy and biology of the four described and seven or eight undescribed Australian species of this genus are discussed by Taylor (1991b).

Distribution and Habitats

On a world-wide basis, *Metapone* contains 16 described species which are known from Madagascar, and India east to Taiwan, the Solomon Islands and Australia. Within Australia they are limited to the east coast from northern Queensland south to Flinders Island, Tasmania, with a single specimen collected in central New South Wales at Nyngan (Fig. 520). The northern collections are from rainforests while the southern ones are from rainforests and coastal vegetation and the Nyngan site is dry sclerophyll.

Fig. 520.
Collection sites for *Metapone* specimens.

List of Australian Species

leae Wheeler
mjobergi Forel
tillyardi Wheeler
tricolor McAreavey

MONOMORIUM

Identification

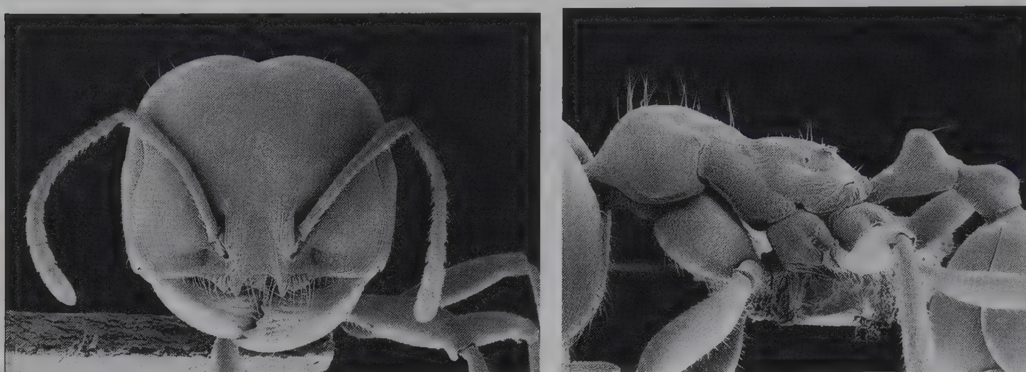
The antennae have 10–12 segments (including the scape) and a three-segmented club (Fig. 521). The front margin of the clypeus just above the mandibles has a single central elongate hair or seta (Figs 226a, 521, 523). The upper surface of the head is smooth and lacks grooves or depressions to receive the antennal scapes (Figs 226, 521, 523). The petiole and, generally, the postpetiole have distinct, arched nodes on their upper surfaces (Figs 522, 524). All workers in a nest can be approximately the same size (monomorphic) or vary greatly in size (polymorphic).

This large and diverse genus can be separated from other Australian ants by the central hair or seta on the front margin of the clypeus (Figs 226a, 521, 523), the three-segmented antennal club (Fig. 521) and the arched nodes on the petiole and postpetiole (Figs 522, 524).

Biology

Species of *Monomorium* are very diverse in size and habits, ranging from very small generalist scavengers to large, polymorphic seed harvesters. Nests vary from small colonies under rocks to large, low mounds, and a few species nest arboreally under bark or in rotten branches. Many species form small mounds in open soil which are highly visible because of the large number of workers foraging in its vicinity. Foraging is primarily during the day, with some species limited to the hotter periods. In addition to the native species, several species have

been introduced into Australia by human activities. These species can be significant pests as they forage in houses and buildings. The biology and taxonomy of this ants is currently being reviewed by B. Heterick.



Figs 521, 522.
Monomorium worker from 10 miles N of Woocalla, South Australia (head 1.95 mm wide).

Figs 523, 524.
Monomorium worker from West Morong Creek, Kanangra-Boyd National Park, New South Wales (head 0.52 mm wide).

Distribution and Habitats

The 351 known species and subspecies of *Monomorium* occur world wide. An additional two species are known from fossils. The 53 currently described Australian species and subspecies are very common in all habitats and all regions (Fig. 525). They can be encountered, often in large numbers, in almost every situation.

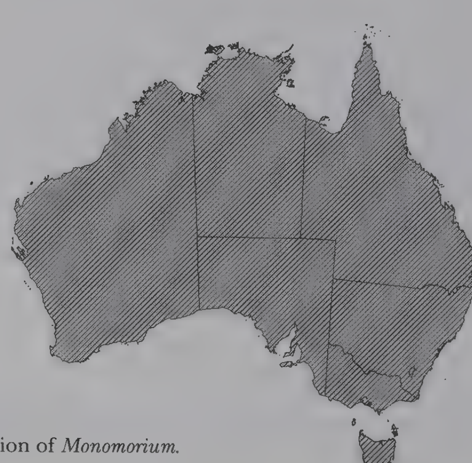


Fig. 525.
Distribution of *Monomorium*.

List of Australian Species and Subspecies

armstrongi McAreavey
australicum Forel
bicorne Forel
broomense Forel
centrale Forel
destructor (Jerdon)
donisthorpei Crawley
falcatum (McAreavey)
fieldi Forel
flavigaster (Clark)
flavipes Clark
floricola (Jerdon)
foreli Viehmeyer
fraterculum Santschi
fraterculum barretti Santschi
gilberti Forel
gilberti mediorubrum Forel
howense Wheeler
ilium Forel
ilium lamingtonense Forel
insolescens Wheeler
insulare Clark
kiliani Forel
kiliani obscurellum Viehmeyer
kiliani tambourinense Forel
laeve Mayr
laeve nigrium Forel
leae Forel (= *hemiphaeum* Clark)
longiceps Wheeler
macareaveyi (Ettershank) (= *niger* McAreavey)
micron Crawley
occidaneum Crawley
pharaonis (Linnaeus)
rothsteini Forel
rothsteini doddi Santschi
rothsteini humilior Forel
rothsteini leda Forel
rothsteini squamigena Viehmeyer
rothsteini tostum Wheeler
rubriceps Mayr
rubriceps cinctum Wheeler
rubriceps extreminigrum Forel
rubriceps rubrum Forel
sanguinolentum Wheeler
sculpturatum Clark
sordidum Forel
sordidum nigriventre Forel
subapterum Wheeler
subapterum bogischi Wheeler
sydneyense Forel
sydneyense nigellum Emery
turneri (Forel)
whitei Wheeler

MYRMECINA

Identification

The sides of the head behind the eyes have an elongate ridge or groove on each side which starts at the mandibles, runs the length of the head and ends near the upper corners (Figs 243a, 527). In side view, the petiole is low, rounded and barrel shaped and lacks a distinct node (Figs 243c, 527). The propodeum is armed with long spines near the angle as well as short spines or angles near the metanotal groove (Figs 243b, 527). The distinctive ridge on the sides of the head behind the eyes (Figs 243a, 527) combined with the low, rounded petiole (Figs 243c, 527) will separate these ants from all others.

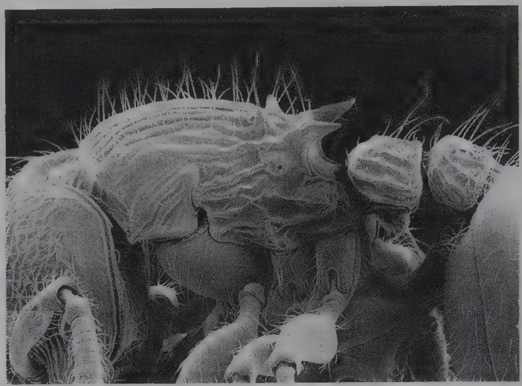
Biology

Most of the collections of these uncommon ants have been from leaf litter samples. The few colonies that have been found were small and occurred either in the soil under or between rocks, or in rotten wood. For an overview of their taxonomy see Taylor (1991b).

Distribution and Habitats

Myrmecina contains 33 known species and subspecies and is found in North and Central America, Europe and northern Africa, as well as India east to Japan and then south through Indonesia and Fiji and into Australia. Within Australia they occur along the east coast of Queensland and New South Wales with two isolated collections, one from central New South

Wales and the other from the Wessel Islands, Northern Territory (Fig. 528). The coastal collections have been in rainforests and wet sclerophyll woodlands while the central New South Wales collection was from under moss in a wet section of a *Callitris* woodland.



Figs 526, 527.
Myrmecina worker from 2 km SSE of Bundanoon, New South Wales (head 0.68 mm wide).

List of Australian Species

australis Wheeler & Wheeler
rugosa Forel

Fig. 528.
Collection sites for *Myrmecina* specimens.

OLIGOMYRMEX

Identification

The antennae have nine or 11 segments (including the scape) and a two-segmented club (Figs 186a, 529, 531). The upper surface of the head is smooth or uniformly sculptured and lacks grooves for the reception of the antennae when at rest (antennal scrobes are absent) (Figs 198, 529, 531). The clypeus has a pair of longitudinal ridges or sharp angles immediately below the antennal sockets, which separate the central region from the lateral regions (clypeus longitudinally bicarinate) (Figs 198a, 529, 531). The eyes are sometimes reduced to a single facet (ommatidium) which is only slightly differentiated from the surrounding integument. The rear face of the propodeum is armed with teeth or spines which vary from short and angular to long and thin, or occasionally the propodeum has thin, elongate flanges which run from just above the insertion of the petiole upwards to near the propodeal angle (Figs 530, 532). The workers are very small (overall body length less than 1.5 mm) and with distinct majors and minors but without intermediates (dimorphic) (compare Figs 529 and 530 with Figs 531 and 532). In most species, the major workers have small horns on the upper surface of the head near the rear margin (Fig. 529).

Minor workers of *Oligomyrmex* are similar to *Solenopsis* workers, but may be separated by the paired hairs on the front margin of the clypeus (Figs 529, 531) (a single central hair is present in *Solenopsis* (Fig. 190a)) and the presence of spines, angles or flanges on the rear face of the propodeum (Figs 530, 532) (this face is smooth in *Solenopsis* (Fig. 579)).

Biology

Minor workers of *Oligomyrmex* are some of the smallest ants in the world, often barely exceeding 1 mm in overall length and sometimes being as small as 0.75 mm long. They nest in the soil, either in the open or under rocks and logs, and are often found in leaf litter samples. They are also commonly found in or near the nests of other species of ants or termites. When associated with other ants or termites, they form small chambers attached to the chambers of their hosts. They then forage into the nests of their hosts where they prey on brood and/or eggs (Greenslade 1979). When encountered by their hosts, *Olgiomyrmex* workers are ignored and seldom attacked.

For an overview of their taxonomy in Australia, see Taylor (1991b), and for detailed notes on the behaviour of a species occurring in Singapore, see Moffett (1986) (no Australian species have yet been examined in detail).

Figs 529, 530.
Oligomyrmex major worker from Gap Creek, 15 km ESE of Mt Finnigan, Queensland (head 0.52 mm wide and 0.66 mm long).

Figs 531, 532.
Oligomyrmex minor worker from Gap Creek, 15 km ESE of Mt Finnigan, Queensland (head 0.30 mm wide and 0.35 mm long).

Distribution and Habitats

There are 102 known species and subspecies of *Oligomyrmex*, with an additional four species known from fossils. They occur world wide in the tropics. In Australia, they are limited to coastal areas of the Kimberley, Top End, Queensland and New South Wales, as well as the Mt Lofty Ranges and Flinders Ranges of South Australia and the Perth region of Western Australia (Fig. 533). They are found in rainforests, wet sclerophyll woodlands and similar moist habitats.

Fig. 533.
Collection sites for *Oligomyrmex* specimens.

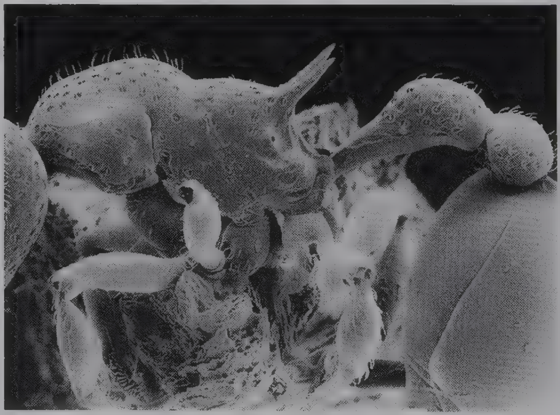
List of Australian Species

atomus Emery
corniger Forel (= *corniger parvicornis* Forel)
crassiusculus (Emery)
mjobergi Forel
norfolkensis Donisthorpe

ORECTOGNATHUS

Identification

The antennae are five-segmented (including the scape) and have the third segment from the tip elongate and much longer than the other segments of the funiculus (Figs 177a, 534). The mandibles are thin, elongate and with only two or three teeth at their extreme tips (Figs 172aa, 534). The structure of the antennae and the shape of the mandibles are unique to these ants and they are unlikely to be confused with others in Australia.



Figs 534, 535.
Orectognathus rostratus Lowery worker from Karrumbyn Creek, 10 miles W of Murwillumbah, Mt Warning State Park, New South Wales (head 0.65 mm wide).

Biology

These ants are fairly commonly encountered. They form small to moderate sized nests in soil under objects, between rocks and slabs of granite, under moss on rocks and in rotten wood. A limited number of species nest arboreally. They are slow moving and forage primarily at night or on dull, overcast days on the ground or on vegetation. When disturbed they lie motionless to avoid detection. Their thin, elongate mandibles act as snap-traps with which they capture soft-bodied arthropods, as well as being used to defend their nests. For biological and taxonomic details see Taylor (1977, 1980a), and for information on behaviour and feeding see Carlin (1981).

Distribution and Habitats

Of the 29 known species of *Orectognathus*, most occur in Australia with a limited number in New Guinea, New Zealand (a single apparently introduced Australian species) and New Caledonia (a single native species). Within Australia they are most abundant in eastern Queensland, New South Wales and Victoria, and Tasmania (Fig. 536). They are rare in eastern Victoria, south-eastern South Australia and south-western Western Australia. Almost all collections are from wet sclerophyll, rainforests, riparian woodlands and other moist areas with only occasional collections being made in dry sclerophyll.

Fig. 536.
Collection sites for *Orectognathus* specimens.

List of Australian Species

alligator Taylor
antennatus Smith (= *antennatus septentrionalis* Forel)
clarki Brown
coccinatus Taylor
darlingtoni Taylor
elegantulus Taylor
howensis Wheeler
kanangra Taylor
mjobergi Forel (= *mjobergi unicolor* Forel)
nanus Taylor
nigriventris Mercovich
parvispinus Taylor
phyllobates Brown
robustus Taylor
rostratus Lowery
satan Brown
sexspinosus Forel
versicolor Donisthorpe

PERONOMYRMEX

Identification

The antennae are 11-segmented (including the scape). In side view, the petiole and postpetiole have high, conical, pointed nodes on their upper surfaces (Figs 225dd, 538). The shape of these nodes is unique among the Australian ant fauna and will allow ready identification of these ants.

Biology

This is one of the rarest ants known from Australia, having been collected only twice. A single worker was found at Trial Bay, New South Wales, and a second collection has since been made in northern Queensland. Unfortunately, the material from northern Queensland was lost before it could be studied in detail and *Peronomyrmex* is currently known from only a single worker. For additional details see Taylor (1970).

Figs 537, 538.
Peronomyrmex overbecki Viehmeyer worker from Trial Bay, New South Wales (head 0.75 mm wide).

Distribution and Habitats

The genus is known from a single specimen collected at or near Trial Bay, New South Wales, and a misplaced collection from an unspecified location in northern Queensland (Fig. 539). No additional details are available.

List of Australian Species

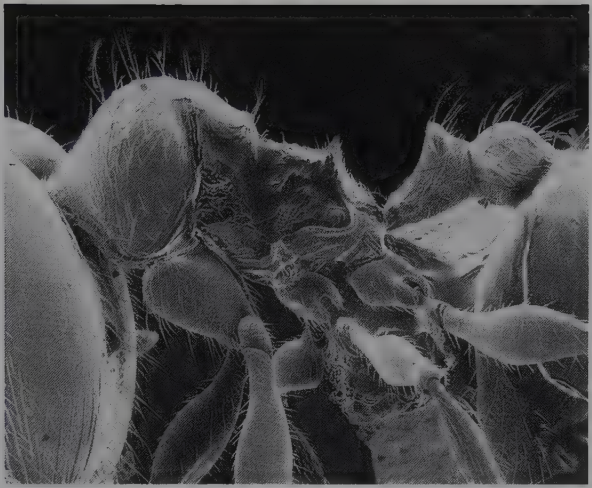
overbecki Viehmeyer

Fig. 539.
Collection sites for *Peronomyrmex* specimens.

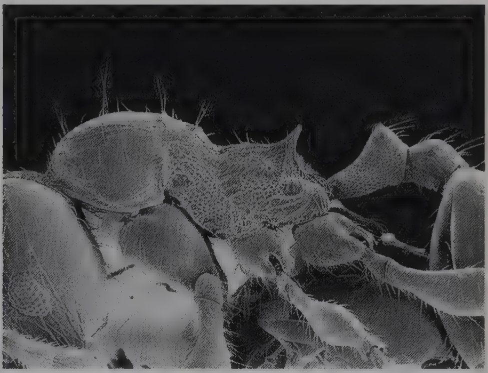
PHEIDOLE

Identification

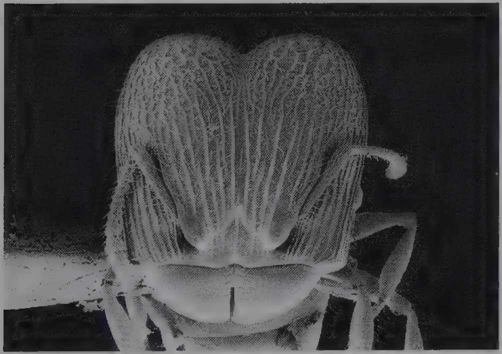
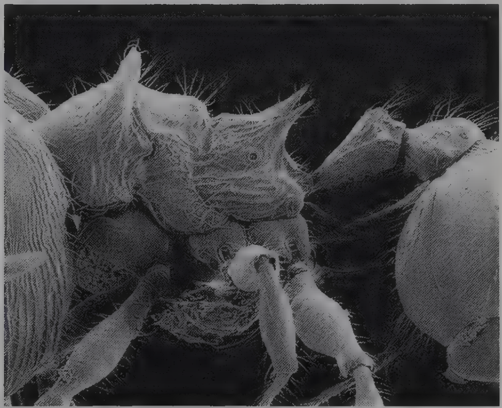
The antennae are 12-segmented (including the scape) and have a three-segmented club (Figs 264, 542, 546). In side view the propodeum is depressed below the level of the pronotum and forward section of the mesonotum, and these two regions are connected by the steeply sloping rear section of the mesonotum (Figs 262a, 541, 543, 545, 547). Workers have distinct majors and minors but lack intermediates (dimorphic) (compare Figs 540 and 541 with Figs 542 and 543, and Figs 544 and 545 with Figs 546 and 547).

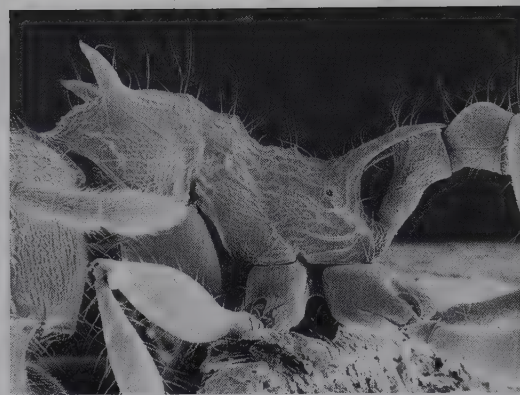
Figs 540, 541.
Pheidole major worker from Cape Bauer, South Australia (head 1.54 mm wide and 1.68 mm long).

Figs 542, 543.
Pheidole minor worker from Cape Bauer, South Australia (head 0.67 mm wide and 0.67 mm long).

Figs 544, 545.
Pheidole major worker from Clump Point, near Tully, Queensland (head 2.13 mm wide and 2.25 mm long).



Figs 546–548.
Pheidole minor worker from Clump Point, near Tully, Queensland (head 0.81 mm wide and 0.81 mm long).

Pheidole is most similar to *Aphaenogaster* and *Pheidologeton*. They can be separated from *Aphaenogaster* by the three-segmented (Fig. 264a) rather than four-segmented (Fig. 265aa) club and generally smaller body size (often under 3.5 mm long), and from *Pheidologeton* by the 12-segmented antennae with a three-segmented club (antennae 11-segmented with a two-segmented club in *Pheidologeton*). Additionally, in *Aphaenogaster* all workers are approximately the same size (they are monomorphic) while in *Pheidologeton* there is continuous size variation between major and minor workers (they are polymorphic).

Biology

This is one of the most common groups of ants in Australia and they can be encountered almost everywhere and at any time. Most species form nests in the soil with a low mound of loose dirt around the entrance. These mounds are often very active with many workers carrying soil from the nest and foraging in the immediate vicinity. This can make nests highly visible. Other species nest under rocks and a few species are known to occasionally nest arboreally. Some rainforest species nest in rotten wood on the ground. Foraging is most common on the ground and large numbers of workers can be found at highly desirable food sources such as honey baits. In the tropics most foraging takes place during the late afternoon and throughout the night while in cooler regions foraging occurs at all times of the day and night. A wide range of food is taken as these ants are general predators and scavengers. They will also feed on seeds and can take large numbers very rapidly (Briese and Macauley 1981, Clayton-Greene and Ashton 1990). The introduced species *P. megacephala* is a pest common along the east and west coasts and in the Darwin region. It can pose a serious threat to local invertebrate communities as it will severely reduce or eliminate native insects, especially other ants, with which it comes in contact.

Distribution and Habitats

Pheidole is the second largest genus of ants in the world with 898 species and subspecies and with an additional three species known from fossil records. They are found world wide. About 53 species and subspecies are known from Australia and these can be found throughout the continent in all habitats (Fig. 549).

Fig. 549.
Distribution of *Pheidole.*

List of Australian Species and Subspecies

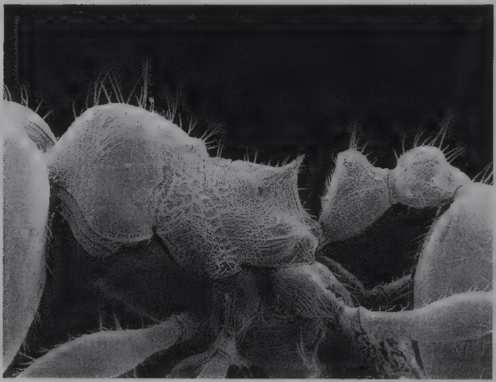
ampla Forel
ampla mackayensis Forel
ampla parviceps Forel
ampla perthensis Crawley
anthracina Forel
anthracina grandii Emery
anthracina orba Forel
athertonensis Forel
athertonensis cedarensis Forel
athertonensis tambourinensis Forel
bos Forel
bos baucis Forel
bos eubos Forel
brevicornis Mayr
cairnsiana Forel
concentrica Forel
concentrica recurva Forel
conficta Forel
deserticola Forel
deserticola foveifrons Viehmeyer
gellibrandi Clark
hartmeyeri Forel
impressiceps Mayr
incurvata Viehmeyer
liteae Forel
longiceps Mayr
longiceps doddi Forel
longiceps frontalis Forel
megacephala (Fabricius)
mjobergi Forel
oceanica Mayr
opaciventris Mayr
platypus Crawley
proxima Mayr
proxima bombalensis Forel
proxima transversa Forel
pyriformis Clark
spinoda (Smith)
tasmaniensis Mayr
tasmaniensis continentis Forel
trapezoidea Viehmeyer
turneri Forel
variabilis Mayr
variabilis latigena Forel
variabilis mediofusca Forel
variabilis ocior Forel
variabilis ocyma Forel
variabilis parvispina Forel
variabilis praedo Forel
variabilis redunca Crawley
variabilis ***rugocciput*** Forel
variabilis rugosula Forel
vigilans (Smith) (= *ampla parallela* Forel, *ampla norfolkensis* Wheeler, *ampla yarrensis* Forel, *dolichocephala* André)
wiesei Forel

Pheidologeton

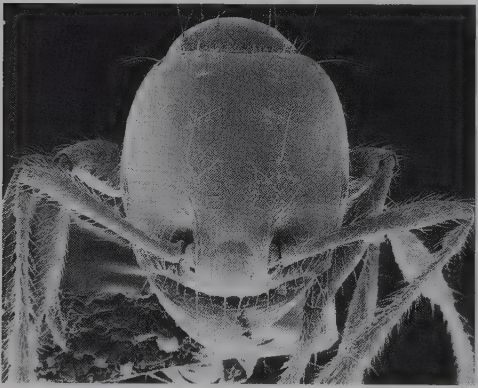
Identification

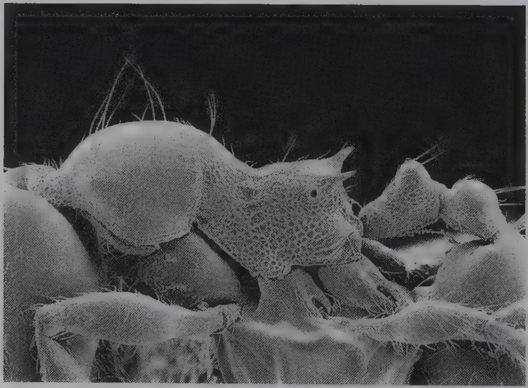
The antennae are 11-segmented (including the scape) and have a two-segmented club (similar to Fig. 186a, Fig. 550). In side view the propodeum is depressed below the level of the pronotum and forward section of the mesonotum, and these two regions are connected by the steeply sloping rear section of the mesonotum (similar to Fig. 262a, Figs 551, 553). The size of workers is highly variable between majors and minors (polymorphic) (compare Figs 551 and 552 with Figs 553 and 554).

Pheidologeton is most likely to be confused with *Aphaenogaster* or *Pheidole*, but can be separated from both by the 11-segmented antennae. Additionally, *Pheidologeton* workers vary greatly and continuously in size between majors and minors (polymorphic) while *Aphaenogaster* workers are all approximately the same size (monomorphic) and *Pheidole* contains only majors and minors (dimorphic).



Figs 550, 551.
Pheidologeton major worker from Shiptons Flat, Queensland (head 1.68 mm wide and 1.89 mm long).





Figs 552, 553.
Pheidologeton minor worker from Shiptons Flat, Queensland (head 0.53 mm wide and 0.62 mm long).

Biology

These ants form very large colonies in soil, either in the open or under wood or rocks. They are general scavengers or predators, foraging on the ground throughout the day and night. Large numbers of workers can be attracted to baits placed on the ground.

Distribution and Habitats

There are 42 known species and subspecies of *Pheidologeton*, with an additional two species known from fossils. They are found from Africa east through India and south into Indonesia and Australia. Within Australia they are limited to the Top End of the Northern Territory as well as north-coastal Queensland (Fig. 554) where they are restricted to rainforests.

List of Australian Species

affinis (Jerdon) (= *affinis australis* Forel, *australis mjobergi* Forel)

Fig. 554.
Collection sites for *Pheidologeton* specimens.

PODOMYRMA

Identification

The antennae are 11-segmented (including the scape). In side view, the petiole and postpetiole are either low and rounded (Fig. 558) or barrel shaped (Figs 214a, 556), or the petiole is armed above with 1–3 small spines or teeth (Fig. 215b). The middle and hind legs have greatly swollen femora (and often tibiae as well) (Figs 217, 556, 558).

The modified petiole (low and rounded or armed with teeth above) (Figs 214a, 215b) and the swollen femora (Fig. 217c) will separate these ants from others in the subfamily Myrmicinae.

Biology

These common ants nest in solid dead wood, often in pre-existing beetle burrows or cracks in trunks, in twigs, vines and mangrove, in large seeds and galls, or in the ground. Foraging is most common on tree trunks or around the base of trees and in the surrounding litter, as well as on grasses, especially in evenings. Most workers forage individually and trails are uncommon. Some species are primarily nocturnal and are rarely collected except at baits, while others will forage day and night. Although they can be common, they are often overlooked or are difficult to find because of their arboreal habits.

Figs 555, 556.
Podomyrma adelaidei species group worker from 15 km NE of Umberatana, Flinders Ranges, South Australia (head 1.32 mm wide).

Figs 557, 558.
Podomyrma worker from 8 km N of Dorrigo, New South Wales (head 0.56 mm wide).

Distribution and Habitats

Podomyrma is limited to the Australian region, extending from Indonesia into New Guinea, the Solomon Islands and Australia. There are 76 described species and subspecies with 49 of these occurring in Australia. An additional species is known from fossil records. They are found in a wide range of forested habitats from rainforests through wet and dry sclerophyll woodlands and into mallee (Fig. 559).

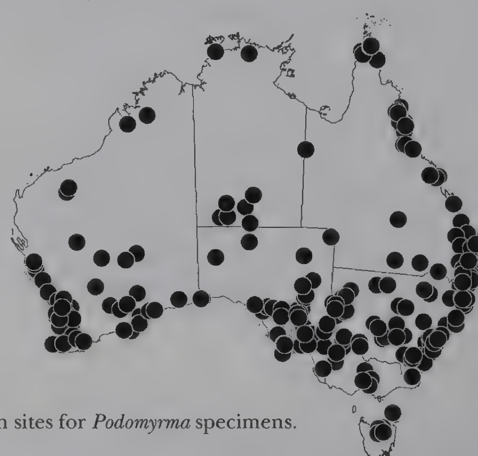


Fig. 559.
Collection sites for *Podomyrma* specimens.

List of Australian Species and Subspecies

abdominalis Emery
abdominalis pulchra Forel
adelaidae (Smith) (= *bimaculata* Forel, *micans sericeiventris* Emery)
adelaidae *brevidentata* Forel
adelaidae obscurior Forel
basalis Smith
bispinosa Forel
chasei Forel
christae (Forel)
clarki (Crawley)
convergens Forel
delbrueckii Forel
densestrigosa Viehmeyer
densestrigosa teres Viehmeyer
elongata Forel (= *parva* Crawley)
femorata Smith
ferruginea (Clark)
formosa (Smith)
fortirugis Viehmeyer
gracilis Emery
gracilis nugenti Forel
gratiosa (Smith)
gratiosa papuana Stitz
grossestriata Forel
inermis Mayr
kitschneri Forel
kraepelini Forel
laevissima Smith
lampros Viehmeyer
libra (Forel)
macrophthalma Viehmeyer
marginata (McAreavey)
micans Mayr

micans maculiventris Emery
mjobergi (Forel)
muckeli Forel
nitida (Clark)
novemdentata Forel
nuda Crawley
obscura Stitz
octodentata Forel
odae Forel
omniparens (Forel)
overbecki Viehmeyer
overbecki varicolor Viehmeyer
rugosa (Clark)
striata Smith (= *castanea* Stitz)
tricolor Clark
turneri (Forel)

PRISTOMYRMEX

Identification

The antennae are 11-segmented (including the scape). Pairs of spines or strong denticles are present on the pronotum and propodeum near the angle as well as near the attachment of the petiole (Figs 212a, 561). These spines are unique to *Pristomyrmex* and will allow ready identification of these ants.

Biology

These uncommon ants nest in rotten wood on the ground, or, in one species, in soil under stones. Although species have not been studied in detail, they are often found foraging at night on rotten logs or low vegetation, while the ground-nesting species (*P. wheeleri*) is restricted to foraging on the ground and in leaf litter. For a detailed review of these ants see Taylor (1965a, 1968).

Figs 560, 561.
Pristomyrmex quadridentatus (André) worker from Upper Allyn Valley, near Eccleston, New South Wales (head 1.02 mm wide).

Distribution and Habitats

There are 43 known species and subspecies of *Pristomyrmex* which occur from Africa east to Japan and south to Indonesia, New Guinea and Australia. In Australia they are found in rainforests along the east coast of Queensland and New South Wales as far south as Sydney (Fig. 562).

List of Australian Species

erythropygus Taylor
foveolatus Taylor
quadridentatus (André) (= *quadridentatus queenslandensis* Forel)
thoracicus Taylor
wheeleri Taylor
wilsoni Taylor

Fig. 562.
Collection sites for *Pristomyrmex* specimens.

QUADRISTRUMA

Identification

The antennae are four-segmented (including the scape). The mandibles are thin and elongate, with only two or three teeth which are found near the extreme tips (similar to Fig. 172aa, Fig. 563). The sides of the petiole and postpetiole and the lower part of the gaster have masses of sponge-like cuticle (Fig. 564).

These ants are recognisable by the four-segmented antennae, the shape of the head (Fig. 563) and the sponge-like structures on the petiole, postpetiole and gaster (Fig. 564). They differ from *Glamyromyrmex*, *Strumigenys* and *Trichoscapa*, which are similar in general body size and shape, in the number of antennal segments and the shape of the mandibles.

Biology

Quadristruma is rare in Australia and is seldom encountered. Nests occur in a range of situations, including in soil, under rocks, in and under logs and under cattle dung. They have also been found nesting in association with other ants, including *Bothriomyrmex mayri* and *Rhytidoponera metallica*. Foraging workers are often encountered in leaf litter samples. Although these ants have not been studied in detail, close relatives are specialised predators of small, soft-bodied arthropods and forage primarily on the ground in leaf litter.

Figs 563, 564.
Quadristruma worker from Sawcut Gorge, Northern Territory (head 0.39 mm wide).

Distribution and Habitats

There are two described species in *Quadristruma*. One of these is limited to New Guinea while the other, *Q. emmae*, is currently understood to be widespread in tropical and subtropical regions throughout the world. However, it is likely that there are several undescribed species of *Quadristruma* in Australia. These occur in a wide variety of habitats, including grasslands, dry sclerophyll and wet sclerophyll woodlands, and rainforests. They have been found mainly in coastal regions of northern Western Australia, the Top End of the Northern Territory, eastern Queensland and New South Wales, with a limited number of collections from inland localities in New South Wales and South Australia (Fig. 565).

Fig. 565.
Collection sites for *Quadristruma* specimens.

List of Australian Species

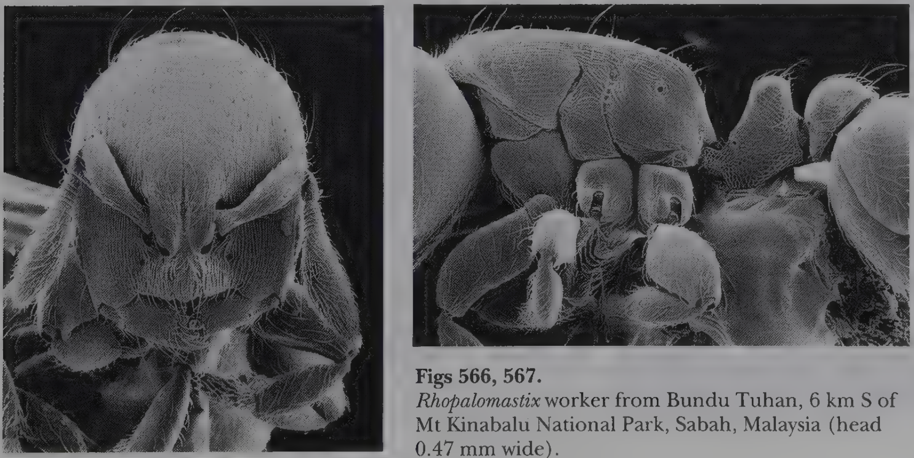
emmae (Emery)

RHOPALOMASTIX

Identification

The antennae are ten-segmented (including the scape) and have a two-segmented club (similar to Fig. 186a, Fig. 566). The front margin of the clypeus just above the mandibles has pairs of elongate hairs or setae which straddle the mid-line of the head and lacks a single central hair or seta, and its central region is smooth and lacks ridges (Figs 191aa, 566). The propodeum is rounded and without spines or teeth (Figs 193, 567). All workers are approximately the same size (monomorphic).

The configuration of the antennae, combined with the shapes of the head (with its strongly arched rear margin) (Fig. 566) and upper surface of the mesosoma (Fig. 566), will separate these ants from all others in Australia.



Figs 566, 567.
Rhopalomastix worker from Bundu Tuhan, 6 km S of Mt Kinabalu National Park, Sabah, Malaysia (head 0.47 mm wide).

Biology

These rare ants have only been encountered a handful of times in Australia and nothing is known of their biology. They have been found foraging on low vegetation and have been collected in a pitfall trap, in rainforests in both cases. In addition, males have been found at a light in a dry sclerophyll woodland. A *Rhopalomastix* species from the Philippines is notable in that it walks with its middle legs raised above the body. However, this trait has yet to be confirmed for the Australian species. For further details about these ants see Taylor (1991b).

Distribution and Habitats

The five known species and subspecies of *Rhopalomastix* have been found from India and Sri Lanka east into Australia. The few Australian collections have been from coastal Queensland and near Darwin (Fig. 568) in rainforests and dry sclerophyll and savannah woodlands.

List of Australian Species

rothneyi Forel

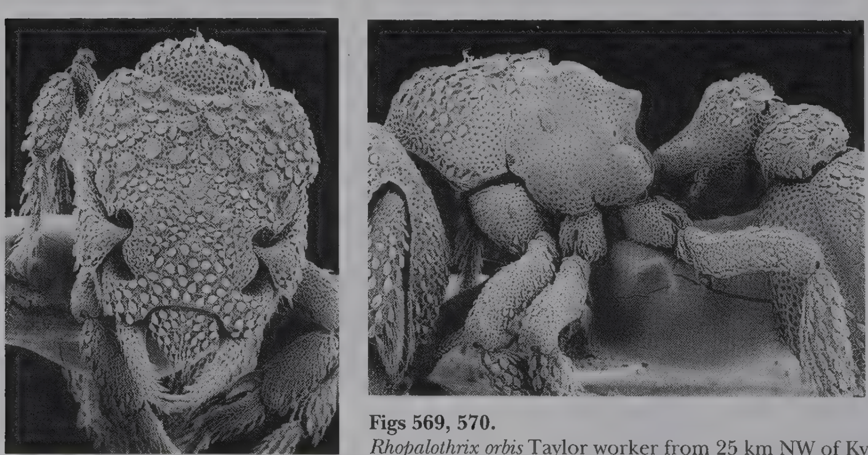
Fig. 568.
Collection sites for *Rhopalomastix* specimens.

RHOPALOTHRIX

Identification

The antennae are seven-segmented (including the scape) and when laid back against the head in their normal resting position, are held in distinct, elongate depressions (antennal scrobes) which pass below the eyes (Fig. 162aa). The mandibles are thin and elongate and when fully closed they are separated by a broad gap for most of their length and touch only at the tips (Figs 169a, 569).

These ants are most similar to *Eurhopalothrix*, but differ in having thin and elongate (Figs 169a, 569) rather than triangular (Figs 170aa, 494) mandibles.



Figs 569, 570.
Rhopalothrix orbis Taylor worker from 25 km NW of Kyogle, New South Wales (head 0.66 mm wide).

Biology

These rare ants have been collected only six times in Australia. Three collections were from leaf litter while the only known nest was found in roots and leaf litter on the buttress of *Lophostemon conferta* about 15 cm above the ground.

Distribution and Habitats

Eight of the known species of *Rhopalothrix* are found in Central and South America with one species occurring in New Guinea and another one in Australia. The Australian species is found in extreme south-east Queensland and north-east New South Wales (Fig. 571) in medium sclerophyll and rainforest.

List of Australian Species

orbis Taylor

Fig. 571.
Collection sites for *Rhopalothrix* specimens.

RHOPTROMYRMEX

Identification

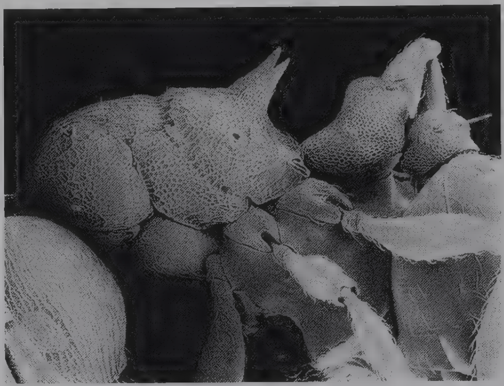
The area of the clypeus immediately below the antennal sockets is raised into a sharp-edged ridge which forms the lower section of a pit around the base of the antennae (Figs 200a, 572). The front margin of the clypeus is strongly arched and projects forward over the rear section of the mandibles (Figs 205aa, 572). The lower surface of the petiole is narrowed into a keel-like ridge (Fig. 573). The propodeum near the insertion of the petiole has short, rounded flanges (Figs 209cc, 573). The tip of the sting has a triangular to pennant-shaped extension projecting upwards from the shaft (visible only when the sting is extended) (Fig. 202b).

The ridge-like structure of the clypeus immediately below the antennal sockets (Fig. 200a) and the projection on the tip of the sting (Fig. 202b) are unique to these ants and those in the genus *Tetramorium.* These two genera can be separated by the shape of the head (somewhat heart shaped in *Rhoptromyrmex* (Figs 205, 572), nearly square or rectangular in *Tetramorium* (Figs 204, 584)), the length of the clypeus (extending forwards in *Rhoptromyrmex* (Figs 205aa, 572), relatively short in *Tetramorium* (Figs 204a, 584)), and the nature of the flanges near the insertion of the petiole (always rounded in *Rhoptromyrmex* (Figs 209cc, 573), often spine-like in *Tetramorium* (Figs 208c, 585)) as well as the lower surface of the petiole (keel-like in *Rhoptromyrmex* (Fig. 573), rounded in *Tetramorium* (Fig. 585)).

Biology

These uncommon ants have been found in leaf litter or foraging in loose columns on the ground, on logs and on low vegetation. They are known to feed on a range of smaller arthropods and to tend Hemiptera both above and below the ground. Nests are in the soil or under bark on rotten logs and in surrounding soil, and can be very large. The queens of *Rhoptromyrmex* are unusually small when compared with workers. It is believed that they found nests by first invading the nests of other ants, or possibly established nests of their own species,

and either replacing the original workers with their own, or, if in a nest of their species, recruiting a portion of the workers to leave the parent nest and begin a new nest with the new queen. For details of these interesting ants see Bolton (1986) and Taylor (1991b).



Figs 572, 573.
Rhoptromyrmex worker from Moses Creek, 4 km N by E of Mt Finnigan, Queensland (head 0.72 mm wide).

Distribution and Habitats

The ten known species and subspecies of *Rhoptromyrmex* are found in tropical areas of Africa east to India and south through Indonesia into New Guinea and Australia. Within Australia they are limited to coastal areas of northern Queensland (Fig. 574). They are found in grasslands, sclerophyll woodlands and scrub, and less commonly in rainforests.

Fig. 574.
Collection sites for *Rhoptromyrmex* specimens.

List of Australian Species

melleus (Emery)
wroughtonii Forel

ROMBLONELLA

Identification

The upper surface of the head has a pair of shallow grooves (antennal scrobes) for the reception of the antennal scapes which are bounded above by ridges (frontal carinae) (Figs 252a, 575). The node of the petiole is about the same length as the petiole so that there is only a very short narrow section (peduncle) in front of the node (Figs 249a, 576). The lower surface of the petiole has a small tooth or angle near the attachment with the propodeum (Figs 256c, 576). The propodeum is armed with a pair of long, stout spines (Figs 256d, 576).

The antennal scrobes (Figs 252a, 575), well-developed propodeal spines (Figs 256d, 576) and the shape of the petiole (Figs 256, 576) will separate these ants from others in Australia.

Biology

Very little is known about the biology of these uncommon ants. While details of the Australian species are unavailable, the limited biological information from overseas suggests that they nest arboreally in twigs and forage on low vegetation. For a summary of their taxonomy and biology see Taylor (1991a).

Figs 575, 576.
Romblonella heatwolei Taylor worker from Wyer Island, Torres Strait, Queensland (head 0.78 mm wide).

Distribution and Habitats

The nine known species and subspecies of *Romblonella* occur from the Philippines south through New Guinea to extreme northern Australia, and east through the islands of the western South Pacific. The sole Australian record is from the Torres Strait Islands (Fig. 577). Overseas these ants have been collected in forested areas.

Fig. 577.
Collection sites for *Romblonella* specimens.

List of Australian Species

heatwolei Taylor

SOLENOPSIS

Identification

The antennae are ten-segmented (including the scape) and have a two-segmented club (Fig. 186). The front margin of the clypeus just above the mandibles has a single central elongate hair or seta (Figs 190a, 578). The rear face of the propodeum is rounded (Figs 192, 579) or with at most low, rounded ridges or protuberances, but never with teeth, spines or thin flanges.

Workers of *Solenopsis* are most often confused with workers of *Oligomyrmex.* They can be separated by the single central hair on the front margin of clypeus (Figs 190a, 578) (paired hairs are present in *Oligomyrmex* (similar to Fig. 227aa, Figs 529, 531)) and the rounded rear face of the propodeum (Figs 192, 579) (spines, teeth or flanges (Figs 530, 531) are present in *Oligomyrmex*). *Solenopsis* may also be confused with smaller species of *Monomorium.* In this case, the distinctly two-segmented club (Fig. 186a) will allow the identification of *Solenopsis.*

Biology

These small, cryptic ants nest either in open soil or under rocks. When in open soil they sometimes have a mound of loose dirt around the nest entrance. They are also sometimes associated with the nests of other ants and termites. In some cases three or four *Solenopsis* nests have been found in a single *Myrmecia* nest. When nesting with other ants or termites, they act as 'thief ants', raiding the host's nests for food. Although relatively uncommon in most areas, they are sometimes locally abundant, foraging in leaf litter or on the ground. The species *S. geminata* is an introduced pest species in northern coastal areas.

Figs 578, 579.
Solenopsis worker from 12 km E of Warburton, Victoria (head 0.39 mm wide).

Distribution and Habitats

World wide there are 266 known species and subspecies of *Solenopsis,* with an additional eight species being known from fossils.

Within Australia these ants are scattered throughout coastal areas with the exception of western Western Australia, and with a limited number of collections from inland areas (Fig. 580). They are more common in cool, wet areas and are one of the commonest ants in Tasmania in terms of number of nests. They are most abundant in dry and wet sclerophyll with fewer records from rainforests and mallee.

Fig. 580.
Collection sites for *Solenopsis* specimens.

List of Australian Species

belisarius Forel
clarki Crawley
froggatti Forel
fusciventris Clark
geminata (Fabricius)
insculpta Clark
pachycera (Forel)

STRUMIGENYS

Identification

The antennae are six segmented (including the scape). The mandibles are thin and elongate, with only two or three teeth, which are found near the extreme tips (similar to Fig. 177aa, Fig. 581). In many species, the sides of the petiole, postpetiole and lower part of the gaster have masses of sponge-like cuticle (Fig. 582). However, in other species these masses are absent and these areas are similar to most other ants.

The shape of the head and mandibles (Fig. 581) and, when present, the sponge-like structures on the petiole, postpetiole and gaster (Fig. 582) will allow recognition of these species. They differ from other ants with these characters (*Glamyromyrmex*, *Quadristruma* and *Trichoscapa*) by having six-segmented antennae and thin, elongate mandibles (Fig. 581).

Biology

Species of *Strumigenys* are difficult to find other than when encountered in leaf litter samples. They form small nests in soil, under or between rocks and in logs. They are normally slow moving but can run quickly when disturbed. Most are specialist predators on Collembola while others will take a range of small soft-bodied arthropods. They are occasionally found at honey baits. They can be locally common while being absent from similar areas nearby. One species, *S. xenos*, is a permanent social parasite. That is, it occurs only as queens with no workers and is always found in the nests of its host, *S. perplexa.*


Figs 581, 582.
Strumigenys friedae Forel worker from 6 km W of Clump Point, Queensland (head 0.42 mm wide).

Distribution and Habitats

There are 168 known species and subspecies of *Strumigenys* which are found world wide in the tropics and subtropics. The 17 known Australian species are found in rainforests through wet and dry sclerophyll woodlands in coastal areas of the Top End of the Northern Territory,

coastal Queensland, eastern New South Wales, Victoria and Tasmania, south-eastern South Australia and southern Western Australia (Fig. 583).

Fig. 583.
Collection sites for *Strumigenys* specimens.

List of Australian Species

anetes Brown
buleru Brown
cochlearis Brown
emdeni Forel
ferocior Brown
friedae Forel
godeffroyi Mayr
guttulata Forel
mayri Emery
opaca Brown
paranetes Brown
perplexa (Smith) (= *leae* Forel)
philiporum Brown
quinquedentata Crawley
szalayi Emery (= *szalayi australis* Forel)
xenos Brown
yaleopleura Brown

TETRAMORIUM

Identification

The area of the clypeus immediately below the antennal sockets is raised into a sharp-edged ridge which forms the lower section of a pit around the base of the antennae (Figs 200a, 584). The front margin of the clypeus is weakly convex, flat or weakly concave and covers only the extreme rear section of the mandibles (Figs 204a, 584). The lower surface of the petiole is rounded from side to side (Fig. 585). The propodeum near the insertion of the petiole is often armed with a pair of spine-like flanges (Figs 208c, 585) although sometimes the flanges are rounded. The tip of the sting has a triangular to pennant-shaped extension projecting upwards from the shaft (visible only when the sting is extended) (Fig. 202b).

The ridge-like structure of the clypeus immediately below the antennal sockets (Fig. 200a) and the projection on the tip of the sting (Fig. 202b) are unique to *Tetramorium* and *Rhoptromyrmex*. They can be separated by (1) the shape of the head (nearly square or rectangular in *Tetramorium* (Figs 204, 584), somewhat heart shaped in *Rhoptromyrmex* (Figs 205, 572)), (2) the length of the clypeus (relatively short in *Tetramorium* (Figs 204a, 584), extending forwards in *Rhoptromyrmex* (Figs 205aa, 572)), (3) the nature of the flanges near the insertion of the petiole (often spine-like in *Tetramorium* (Figs 208c, 585), always rounded in *Rhoptromyrmex* (Figs 209cc, 573)), and (4) the lower surface of the petiole (rounded in *Tetramorium* (Fig. 585), keel-like in *Rhoptromyrmex* (Fig. 573)).

Biology

Within their preferred habitats these ants can be very common. They forage individually on the ground, often in large numbers, and are most active during the morning and evening

hours. In many sites four or five separate species can be found. Nests are in soil with a simple entrance. They are general scavengers or predators and seed collecting is common in some but not all species (Briese and Macauley 1981). The taxonomy of these ants is reviewed by Bolton (1977).

Figs 584, 585.
Tetramorium validiusculum Emery worker from 11 km ENE of Mt Tozer, Queensland (head 0.82 mm wide).

Distribution and Habitats

Tetramorium contains 445 known species and subspecies which are found world wide. The 24 described Australian species are found in all locations (Fig. 586) and all major habitats although they are much less common in cool, wet localities.

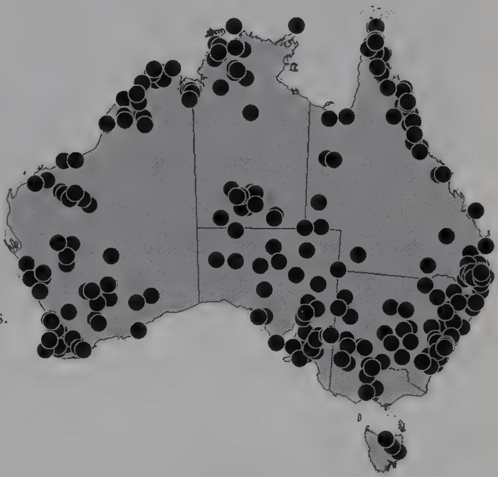


Fig. 586.
Collection sites for *Tetramorium* specimens.

List of Australian Species

andrynicum Bolton
antipodum Wheeler
bicarinatum (Nylander)
capitale (McAreavey)
confusum Bolton
deceptum Bolton
fuscipes (Viehmeyer)
impressum (Viehmeyer)
lanuginosum Mayr (= *striatidens australis* Forel)
laticephalum Bolton
megalops Bolton
ornatum Emery
pacificum Mayr
simillimum (Smith)
sjostedti Forel
spininode Bolton
splendidior (Viehmeyer)
strictum Bolton
striolatum Viehmeyer
taylori Bolton (= *australe* Bolton)
thalidum Bolton
turneri Forel
validiusculum Emery
viehmeyeri Forel (= *viehmeyeri venustus* Wheeler)

Trichoscapa

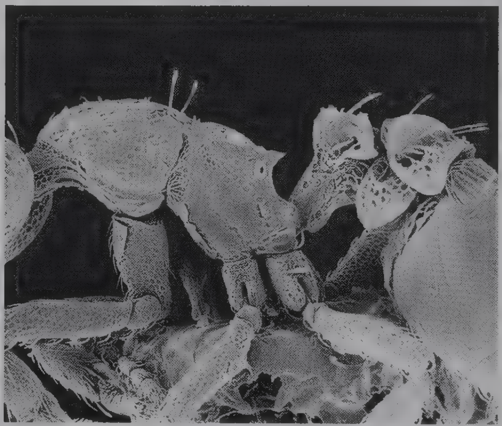
Identification

The antennae are six-segmented (including the scape). The mandibles are short and triangular and with eight or more teeth along their entire inner margins (Figs 171a, 587). The rear face of the propodeum has a pair of small spines or teeth (Figs 174aa, 588). The sides of petiole and postpetiole and lower part of the gaster have masses of sponge-like cuticle (Fig. 588).

The shape of the head (Fig. 587) and the sponge-like structures on the petiole, postpetiole and gaster (Fig. 588) will separate these ants from most others. Compared with others with these characters (*Glamyromyrmex, Quadristruma* and *Strumigenys*) only *Trichoscapa* has triangular (Fig. 587) mandibles and propodeal spines or teeth (Figs 174aa, 588).

Biology

Only a single species of *Trichoscapa* is known from Australia, and it has only been collected twice from rainforests on Cape York Peninsula. Species in this genus are ground foragers and are most often encountered in leaf litter. They nest under bark or under rocks and similar objects on the ground. They are predacious, feeding primarily on small arthropods with some species specialising on Collembola.



Figs 587, 588.
Trichoscapa karawajewi (Brown) worker from near Vanimo, Papua New Guinea (head 0.37 mm wide).

Distribution and Habitats

There are over 100 described species and subspecies of *Trichoscapa,* which occur throughout the tropics and subtropics of the world, and in some regions extend into temperate areas. Within Australia, the single known species is limited to rainforests on Cape York Peninsula (Fig. 589).

List of Australian Species

karawajewi (Brown) (= *dubia* (Brown))

Fig. 589.
Collection sites for *Trichoscapa* specimens.

VOLLENHOVIA

Identification

The node of the petiole is about the same length as the petiole so that there is only a very short narrow section (peduncle) in front of the node (Figs 257, 591). The upper surface of the head is smooth or uniformly sculptured and lacks grooves for the reception of the antennae when at rest (antennal scrobes are absent) (Figs 253aa, 590). The palp formula is 2:2 (both outer and inner palps with two segments each) (Fig. 255bb). The lower surface of the petiole near the propodeum has a large rounded or angular plate (Figs 257cc, 591). The propodeum is rounded (Figs 257dd, 591) or at most with a pair of small, triangular teeth.

The elongate node of the petiole combined with the large plate on the petiole's lower surface (Figs 257, 591) will allow identification of species of *Vollenhovia.*

Figs 590, 591.
Vollenhovia worker from 9 km ENE of Mt Tozer, Queensland (head 0.76 mm wide).

Biology

Vollenhovia is uncommon in Australia. They form small colonies in wood on the ground and forage on the ground as well as on vegetation. They have yet to be studied in detail. For an overview of the Australian species (including several which are undescribed) see Taylor (1991b).

Distribution and Habitats

Vollenhovia contains 67 known species and subspecies with an additional two species known from fossils. They occur from India and Sri Lanka east to Korea and south through Indonesia, Fiji, Vanuatu and New Caledonia and into Australia. Within Australia they are limited to rainforests on Cape York Peninsula, Queensland, south to approximately Innisfail (Fig. 592).

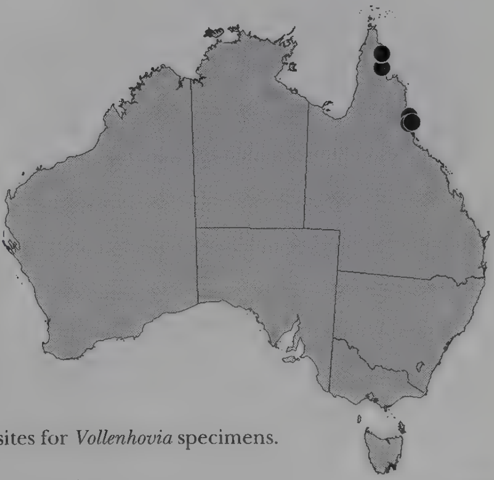


Fig. 592.
Collection sites for *Vollenhovia* specimens.

List of Australian Species

oblonga (Smith)

Vombisidris

Identification

The sides of the head behind the eyes have an elongate ridge or groove on each side which starts at the mandibles, runs the length of the head and ends near the upper corners, and touches the lower surface of the eye (Figs 244aa, 594). In side view, the petiole has a distinct, arched node on its upper surface (Figs 244cc, 594).

The distinctive ridge or groove on the sides of the head behind the eyes (Figs 244aa, 594) combined with the high, arching petiolar node (Figs 244cc, 594) will separate these ants from all others.

Biology

These rare ants nest and forage arboreally and little is known about their biology. The few nests which have been found were in twigs. For an overview of the currently available information see Taylor (1989).

Figs 593, 594.
Vombisidris australis (Wheeler) worker from Palmerston National Park, Queensland (head 0.66 mm wide).

Distribution and Habitats

The 12 known species of *Vombisidris* range from India east through Indonesia to Papua New Guinea and Australia. Within Australia they occur in rainforests of Cape York Peninsula, Queensland, south to approximately Tully (Fig. 595).

List of Australian Species

australis (Wheeler)
renateae (Taylor)

Fig. 595.
Collection sites for *Vombisidris* specimens.

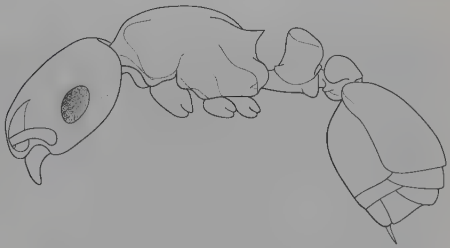
Willowsiella

Identification

The upper surface of the mesosoma is evenly convex and lacks a metanotal groove (Figs 228a, 597). When viewed from above, the petiole and postpetiole are very broad and about the same width as the propodeum (Fig. 230b). The unique shape of the petiole and postpetiole will allow ready recognition of these ants.

Biology

This is one of the rarest groups of ants in the world, being known from only a hand full of specimens representing two species, one of which is Australian. The Australian specimens were collected in pitfall traps and nothing is known of their biology. For additional details see Taylor (1991a).



Figs 596, 597.
Willowsiella anderseni Taylor worker from King Edward River, Kimberley District, Western Australia (head 0.47 mm wide).

Distribution and Habitats

This small, rare genus contains only two known species, one found in the Kimberley district of northern Western Australia (Fig. 598) and the other in the Solomon Islands. The Australian species was collected in sclerophyll woodland.

List of Australian Species

anderseni Taylor

Fig. 598.
Collection sites for *Willowsiella* specimens.

Unnamed Genus #1

Identification

The antennae are 12-segmented (including the scape) and have a two-segmented club. Behind the eyes the head has an elongate ridge on each side which starts above the mandibles and ends near the upper corners (Fig. 194a). The rear face of the propodeum is armed with distinct spines (Fig. 600). These ants can be recognised by the form of the antennae and the ridge along the side of the head behind the eyes.

Biology

This genus is one of the rarest in Australia, having been collected only once. This collection consists of two workers and lacks all information other than the locality. Therefore, nothing is known about nest sites or habitat preferences.

Figs 599, 600.
Unnamed Genus #1 worker from Bogan River, New South Wales (head 0.64 mm wide).

Distribution and Habitats

This genus is known from a single collection along the Bogan River, central New South Wales (Fig. 601).

List of Australian Species

The only species currently known to belong to this genus is undescribed.

Fig. 601.
Collection sites for Unnamed Genus #1 specimens.

UNNAMED GENUS #2

Identification

The antennae are 12-segmented (including the scape). The upper surface of the head is smooth or uniformly sculptured and lacks grooves for the reception of the antennae when at rest (antennal scrobes are absent) (Figs 271a, 602). The eyes have eight or more facets (ommatidia) in greatest diameter and are distinctly oval or elongate. The mandibles have four or five teeth (Fig. 271b). The upper surface of the propodeum is approximately even with the pronotum and mesonotum so that the upper surface of the mesosoma forms a uniform arch interrupted only by the shallow metanotal groove (similar to Fig. 263aa, Fig. 603). The tip of the sting is broadly flattened and expanded (visible only when the sting is extended) (Fig. 273c).

These ants are superficially similar to workers of *Lordomyrma* and *Tetramorium.* They can be separated from *Lordomyrma* by the fewer teeth on the mandibles (four or five in this group (Fig. 271b), six or more in *Lordomyrma*) and the broad, expanded tip of the sting (Fig. 273c) (which is sharply pointed in *Lordomyrma* (Fig. 274cc)). They differ from *Tetramorium* in having the region below the antennal socket rounded (Fig. 602) rather than ridged (Fig. 200a), and in lacking a triangular extension (Fig. 202b) on the tip of the sting.

Figs 602, 603.
Unnamed Genus #2 worker from Mt Ainslie, ACT (head 0.78 mm wide).

Biology

These ants are general scavengers which nest in the soil, often at the base of trees. Little else is known about their biology.

Distribution and Habitats

This group is found from south-east Queensland south and west to the Eyre Peninsula of South Australia as well as in south-west Western Australia (Fig. 604). Most collections have been from dry sclerophyll with a limited number from mallee.

List of Australian Species

The single described species in this group was originally named *Xiphomyrmex flavigaster* Clark and is currently known as *Monomorium flavigaster* (Clark). This placement, however, is incorrect and is being reviewed.

Fig. 604.
Collection sites for Unnamed Genus #2 specimens.

SUBFAMILY NOTHOMYRMECIINAE

Identification

The mandibles are triangular, elongate and with more than 15 teeth along their inner margins (Fig. 605). The petiole is composed of a single segment which is about the same length as the first segment of the gaster (Figs 296, 606). The gaster is smooth, without constrictions between the segments (Fig. 29). A sting is present at the tip of the gaster (Fig. 29a) (although it may be retracted and difficult to see). These are the only ants with a sting and without a postpetiole or constriction between the first and second gastral segments.

Overview

This subfamily contains a single known species and is restricted to mallee of southern Australia. Although they are rarely encountered, it appears that they are more common and widespread than the known material would suggest. This is largely because of their inconspicuous nests and cryptic foraging behaviour. Considered from an evolutionary viewpoint they are an important group and have received extensive attention.

Nothomyrmecia

Identification

Workers of *Nothomyrmecia* are distinctive because of their pale yellow colour, large eyes, elongate mandibles, lack of a postpetiole and the presence of a sting (for additional details, see the subfamily identification section above). They are unlikely to be confused with any other Australian ant.

Biology

These rare ants have a restricted distribution and have only been encountered at a few sites. It is likely that this rarity is due largely to the habits of these ants. Workers are strictly nocturnal and show a strong preference for cool or cold nights. They also forage singly on trees and are only found on the ground for a short time as they leave and return to their nests. Nests are small, with less than 100 workers, and are in soil with a small, simple, cryptic entrance. Workers are predacious, taking only live prey, as well as tending Hemiptera for honeydew. For extensive discussions on this genus see Taylor (1978), Hölldobler and Taylor (1984), and Jaisson, Fresneau, Taylor and Lenoir (1992), as well as papers cited in these works.

Figs 605, 606.
Nothomyrmecia macrops Clark worker from Poochera, South Australia (head 1.41 mm wide).

Distribution and Habitats

The single known species of *Nothomyrmecia* is restricted to mallee of southern South Australia and Western Australia (Fig. 607). The only collection from Western Australian consists of two workers found near Russell Range in 1931–2. It has not been seen in this area since, in spite of extensive effort on numerous occasions (Brown and Wilson 1959).

List of Australian Species

macrops Clark

Fig. 607.
Collection sites for *Nothomyrmecia* specimens.

SUBFAMILY PONERINAE

Identification

The mesosoma is attached to the gaster with a single distinct segment, the petiole (Figs 279a, 280aa). The gaster usually has a slight but distinct impression between the first and second segments (Fig. 276). In some cases (species of *Discothyrea*) the gaster is highly modified and the impression is weak or essentially absent, but in these the tip of the gaster is directed downwards and located along the lower surface of the body (Fig. 275). In a few other cases (species of *Odontomachus*) the gaster is smooth and uniform, but here the mandibles are elongate and straight, with teeth only at the extreme tip, and attached close together along the front margin of the head (Fig. 291). The upper surface of the tip of the gaster (the pygidium) is rounded and lacks a row of spines or teeth on its outer and trailing edge (Fig. 26aa). The sting is present (although often retracted and difficult to see) (Fig. 26).

Most species in this large and diverse subfamily can be identified by the presence of a single-segmented petiole combined with a constriction between the first and second segment of the gaster. In the few cases where the constriction is weak or absent (*Discothyrea* and *Odontomachus*), the overall shape of the gaster or the shape of the head can be used to identify these ants (see above for details)

Overview

Species of ponerines range from small and cryptic to large and conspicuous. They are found throughout Australia from pristine habitats to disturbed sites such as gardens and parks, and can be quite abundant. Workers are predacious, generally forage on the ground, and some specialise on a very limited range of prey. In addition, many species have powerful and painful stings used for subduing prey and as a defensive measure against intruders.

There are about 2000 described species and subspecies in the subfamily Ponerinae, placed in 42 genera. Within Australia there are about 200 described species in 22 genera, with one genus and numerous species yet to be studied in detail.

AMBLYOPONE

Identification

The mandibles are long and slender, with at least five teeth which vary greatly in size and are scattered along the entire inner margins, and with a sharp, pointed tooth at their tips which is no more than twice as long as the next longest tooth (Figs 289, 608). The frontal lobes extend only slightly forward of the antennal sockets and do not cover the clypeus when viewed from the front (Figs 289, 608). The petiole has distinct front and upper faces but lacks a rear face, and its attachment to the gaster is broad and approximately the same height as the petiole so that the upper surfaces of petiole and gaster are separated by at most a shallow impression (Figs 279, 609). The tibiae of the hind legs each have a large, comb-like (pectinate) spur at their tips (best viewed from the front) (Fig. 287a).

Species of *Amblyopone* are most similar to those of *Onychomyrmex*, but differ in having the tooth at the tip of the mandible smaller (compare Fig. 289b with Fig. 290bb) and having a distinct comb-like spur on the hind tibia (compare Fig. 287a with Fig. 288aa).

Biology

Species of *Amblyopone* can be locally common and are regularly encountered. They nest in soil under rocks or logs or in rotten wood. Nests often lack large central chambers and instead are composed of many small satellite nests, consisting of a few workers together with a small amount of brood, dispersed over a small area. Workers are cryptic predators in soil and leaf

litter and are seldom seen foraging on the surface of the ground. Some species show a strong preference for centipedes while others will feed on a range of soft-bodied arthropods. When disturbed they will move slowly underground or remain motionless. For additional details see Brown (1960).

Figs 608, 609.
Amblyopone worker from Pt Lookout, New England National Park, New South Wales (head 1.67 mm wide).

Distribution and Habitats

Amblyopone contains 62 described species, 17 of which are known from Australia. They are found throughout the world in tropical and temperate areas. Within Australia they occur in relatively moist sites along the east coast of Queensland, eastern New South Wales, Victoria, Tasmania, southern South Australia and southern Western Australia (Fig. 610). There are also isolated records from rainforests or riparian habitats in northern Western Australia.

Fig. 610.
Collection sites for *Amblyopone* specimens.

List of Australian Species

- ***aberrans*** Wheeler
- ***australis*** Erichson (= *australis fortis* Forel, *australis foveolata* Wheeler, *australis minor* Forel, *obscura* Smith)
- ***clarki*** Wheeler
- ***exigua*** Clark
- ***ferruginea*** Smith (= *mandibularis* Clark)
- ***gingivalis*** Brown
- ***glauerti*** (Clark)
- ***gracilis*** Clark
- ***hackeri*** Wheeler
- ***leae*** Wheeler
- ***longidens*** Forel
- ***lucida*** Clark
- ***mercovichi*** Brown
- ***michaelseni*** Forel
- ***punctulata*** Clark
- ***smithi*** Brown
- ***wilsoni*** Clark

Anochetus

Identification

When viewed from the front, the outer surface of the head is complex, with narrow sections above and below bulging convexities which contain the eyes (similar to Fig. 291, Fig. 611). The mandibles are long and straight, are inserted in the middle of the front margin of the head, and generally have only two or three large teeth near the tips (Figs 291a, 611) (although they sometimes have small teeth along the inner margins which are much smaller than the teeth at the tips). The top of the head is uniformly coloured and lacks dark lines (Fig. 294aa). The upper front of the head is usually smooth (Fig. 294bb) although it sometimes has a weak, ill-defined central groove.

The unique shape of the head and mandibles (Fig. 611) will separate these ants from all others except *Odontomachus*. *Anochetus* differs from *Odontomachus* in being smaller in overall length, in having the upper surface of the head smooth (compare Fig. 294bb with Fig. 293b) and without a pair of dark lines (compare Fig. 294aa with Fig. 293a), in having the gaster with a constriction between the first and second segments and in having the upper surface of the petiole either rounded or with a pair of small teeth and never with a single spine.

Biology

These ants form small nests, usually with fewer than 100 workers, in soil, in termite nests or under logs. They are predacious on small invertebrates, using their trap-like jaws and sting to capture and subdue prey. They commonly forage in leaf litter and are less frequently found in the open, especially when compared with workers of the closely related genus *Odontomachus*. For additional information on their biology and taxonomy see Brown (1978).

Figs 611, 612.
Anochetus worker from Bom Bom State Forest, 5 miles S of Grafton, New South Wales (head 0.92 mm wide).

Distribution and Habitats

The 87 described species of *Anochetus* are found in tropical regions throughout the world. There are also eight species known from fossil records. They are widespread in Australia (Fig. 613), ranging from savannah woodlands to rainforests. They are less common or absent from arid areas and the cool, wet regions of south-east New South Wales, Victoria, Tasmania and south-west Western Australia.

List of Australian Species

armstrongi McAreavey
graeffei Mayr
paripungens Brown
rectangularis Mayr (= *rectangularis diabolus* Forel)
turneri Forel

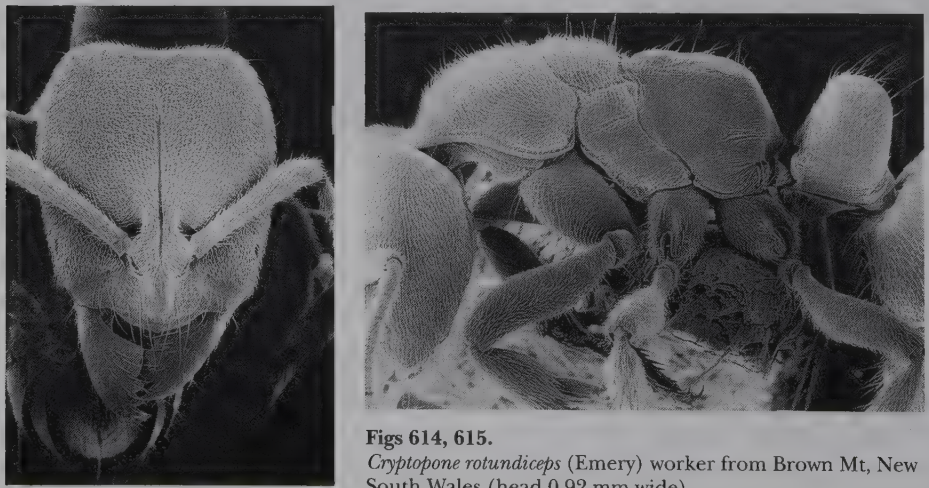
Fig. 613.
Collection sites for *Anochetus* specimens.

CRYPTOPONE

Identification

The eyes are small, with fewer than ten facets (ommatidia) (Figs 309, 614). The mandibles are triangular, with numerous small teeth along their inner margins (Fig. 614), and with a small oval or round depression or pit on their sides near the insertion into the head (Fig. 309a). The forward sections of the frontal lobes and antennal sockets are very close together and are separated by at most a very narrow rearward extension of the clypeus (Fig. 298aa). The node of the petiole has distinct front, top and rear faces (Figs 280aa, 615). The outer surfaces of the tibiae of the middle legs usually have a mixture of thickened peg-like setae or narrow spines and normal, thinner hairs (Fig. 311b). The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (best viewed from the front) (Fig. 307a).

Cryptopone belongs to a set of genera with similar overall body shape which includes *Hypoponera, Pachycondyla* and *Ponera. Cryptopone* differs from these in having a small oval or round depression or pit on the side of the mandible near the insertion into the head (Fig. 309a) and most species also have thickened peg-like setae or narrow spines on the outer surfaces of the tibiae of the middle legs (Fig. 311b). A few species of *Pachycondyla* have a similar pit on the mandible, but these have both a large comb-like and a smaller simple spur on the hind leg (Fig. 308aa) while *Cryptopone* has only a single comb-like spur on its hind leg (Fig. 307a).



Figs 614, 615.
Cryptopone rotundiceps (Emery) worker from Brown Mt, New South Wales (head 0.92 mm wide).

Biology

Nests of *Cryptopone* are usually in soil under rocks, or in rotten wood. The limited information available on these ants suggests that nests are small, with fewer than 100 workers, and that foraging is primarily underground, in leaf litter or in rotten wood. The heavy setae or thin spines on the outer sides of the tibiae of the middle legs are thought to improve traction as workers forage through narrow passages in soil or rotten wood.

Distribution and Habitats

The 16 described species and subspecies of *Cryptopone* are found world wide. Within Australia the single described species is found along the east coasts of Queensland and New South Wales, in eastern Victoria and northern Tasmania, and has been collected once in south-west Western Australia (Fig. 616). Most records are from wet sclerophyll and rainforests but they are also occasionally found in dry sclerophyll.

List of Australian Species

rotundiceps (Emery) (= *mjobergi* Forel)

Fig. 616.
Collection sites for *Cryptopone* specimens.

DIACAMMA

Identification

The sides of the mesosoma above the front legs and just below the upper surface have conspicuous pocket-like pits on each side (Figs 319a, 618). The petiole is armed with a pair of spines on its upper surface (Figs 319b, 618). These large, black ants are immediately recognisable by the pit on the side of the mesosoma and the spines on the upper surface of the petiole.

Figs 617, 618.
Diacamma worker from 23 km SE of Marlborough, Bruce Highway, Queensland (head 2.24 mm wide).

Biology

Species of *Diacamma* nest in loose debris on the ground's surface or less commonly in soil with a mound around the entrance. Many nests are only used for a short period before the colony moves to a new site, although nests in soil can be used for many years and can develop into large mounds with a single large entrance. The usual queen caste is lacking and instead mated workers produce brood. For details concerning the biology of these ants see Billen and Peeters (1991), Peeters and Higashi (1989), and Peeters, Billen and Hölldobler (1992).

Distribution and Habitats

Diacamma contains 42 known species and subspecies which are found from India east through South-east Asia and south through Indonesia into New Guinea and Australia. Within Australia they occur in savannah woodlands through rainforests along the east coast of Queensland south to about Bundaberg, and in riparian areas of the Top End of the Northern Territory (Fig. 619).

Fig. 619.
Collection sites for *Diacamma* specimens.

List of Australian Species

australe (Fabricius) (= *australe colosseensis* Forel, *australe levis* Crawley)

DISCOTHYREA

Identification

The upper plate (tergite) of the second segment of the gaster is strongly arched so that it forms the rear-most part of the gaster when viewed from the side, and the remaining segments are pushed forward so that the sting is pointing towards the front (Fig. 275). The mandibles have only a single tooth at the tip (Fig. 277a). The clypeus extends forwards so that it overhangs the rear part of the mandibles when they are closed (Figs 277b, 620). The antenna has ten or fewer segments (including the scape) and the last (apical) segment is greatly enlarged and about as long as the remaining segments combined (excluding the scape) (Figs 277c, 620).

The distinctive shape of the gaster will separate these ants from all others except *Proceratium*. They can be distinguished from *Proceratium* by the configuration of the antennae, mandibles and leading edge of the clypeus (compare Figs 277 and 620 with Figs 278 and 669).

Biology

These small ants are infrequently encountered. They form small nests with fewer than 50 workers in open soil or in soil under rocks, or in rotten wood. They are sometimes associated with other ants, being found in or near their nests. Foraging occurs in leaf litter where they are thought to be specialist predators on arthropod eggs. To avoid detection, workers will lie motionless when disturbed. For additional information see Brown (1958c, 1980).

Distribution and Habitats

There are 27 known species of *Discothyrea* which occur world wide in the tropics and subtropics. Within Australia they occur in wet sclerophyll woodlands and rainforests along the

east coasts of Queensland, New South Wales and Victoria, throughout Tasmania, and in south-west Western Australia (Fig. 622). There is also a single collection from Millstream National Park in northern Western Australia.

Figs 620, 621.
Discothyrea worker from Mt Webb National Park, Queensland (head 0.36 mm wide).

List of Australian Species

- ***bidens*** Clark
- ***crassicornis*** Clark
- ***leae*** Clark
- ***turtoni*** Clark
- ***velutina*** (Wheeler)

Fig. 622.
Collection sites for *Discothyrea* specimens.

GNAMPTOGENYS

Identification

The forward sections of the frontal lobes and the antennal sockets are separated by the broadly rounded or triangular rearward extension of the clypeus (Figs 297a, 623). When viewed from above, the pronotum and mesonotum form a single, uninterrupted plate (Figs 299a, 624). The first segment (coxa) of the hind leg has a tooth or spine on its upper surface near the body (Figs 299a, 624). The node of the petiole has distinct front, top and rear faces (Figs 299, 624).

While these ants share many features with *Heteroponera* and *Rhytidoponera*, the fused pronotum and mesonotum (Figs 299a, 624) and the spine on the coxa of the hind leg (near the body) (Figs 299b, 624) are unique and will separate these ants from all others.

Biology

Gnamptogenys is rare in Australia, having been collected fewer than ten times. They form small colonies with less than 100 workers in rotten logs on the ground. Workers are general predators on arthropods and forage in leaf litter.

Figs 623, 624.
Gnamptogenys biroi (Emery) worker from 9 km ENE of Mt Tozer, Queensland (head 1.13 mm wide).

Distribution and Habitats

While there are 99 known species of *Gnamptogenys* world wide (with an additional three species known from fossils), only a single species is found in Australia. World wide they are found in Central and South America, and Burma south through Indonesia and into Australia. Within Australia they are limited to rainforests on Cape York Peninsula, Queensland (Fig. 625).

List of Australian Species

biroi (Emery)

Fig. 625.
Collection sites for *Gnamptogenys* specimens.

HETEROPONERA

Identification

The forward sections of the frontal lobes and the antennal sockets are separated by the broadly rounded or triangular rearward extension of the clypeus (Figs 297a, 626). The node of the petiole has distinct front, top and rear faces (Fig. 627). The tips of the tibiae of the hind legs each have either a single, simple (Fig. 302aa) or comb-like (pectinate) (Fig. 303bb) spur, or have two spurs, one large and comb-like (pectinate) and one small and simple (Fig. 304cc) (best viewed from the front). The claws on the hind legs are simple and lack a tooth on their inner surface (Fig. 306aa).

Workers of *Heteroponera* are most often confused with those of *Rhytidoponera*. They may be separated by the simple claws on the hind legs which lack a tooth along their inner margins (compare Fig. 306aa with Fig. 305a).

Figs 626, 627.
Heteroponera worker from the Cape Tribulation area, Queensland (head 1.00 mm wide).

Biology

These ants are infrequently encountered and are most commonly found in leaf litter samples. They form small nests with fewer than 200 workers in soil under rocks or in rotten wood and are known to have both normal and worker-like (ergatoid) queens. For additional details see Brown (1958b).

Distribution and Habitats

There are 12 species of *Heteroponera* described from Central and South America, three from Australia and a single species from New Zealand. Within Australia they occur in mallee and spinifex through to rainforests along the east coasts of Queensland and New South Wales, southern Victoria and south-eastern South Australia and south-west Western Australia (Fig. 628). They are not known to occur in Tasmania.

Fig 628.
Collection sites for *Heteroponera* specimens.

List of Australian Species

imbellis (Emery) (= *imbellis hilare* Forel, *imbellis scabra* Wheeler, *nigra* Clark, *occidentalis* Clark)
leae (Wheeler)
relicta (Wheeler)

HYPOPONERA

Identification

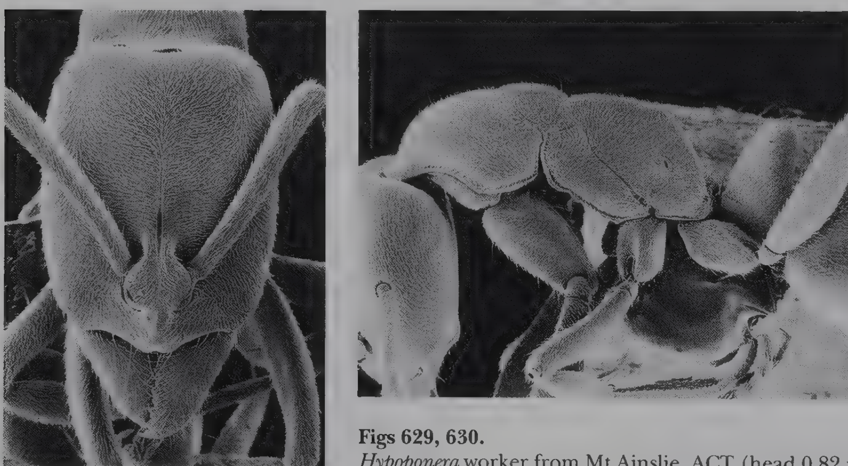
The mandibles are triangular with numerous small teeth along their inner margins (Figs 314aa, 629). The forward sections of the frontal lobes and antennal sockets are very close

together and are separated by at most a very narrow rearward extension of the clypeus (Figs 298aa, 629). The node of the petiole has distinct front, top and rear faces (Figs 316, 630). The underside of the petiole (subpetiolar process) is uniformly convex and smooth (Fig. 316aa). The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (best viewed from the front) (Fig. 307a).

Hypoponera belongs to a set of genera with similar overall body shape that includes *Cryptopone, Pachycondyla* and *Ponera. Hypoponera* differs from *Cryptopone* in lacking a depression or pit on the outer surface of the mandible near its attachment to the head (Fig. 309a) and in having the hairs on the outer surface of the middle legs uniform in size (Fig. 312bb) (rather than two distinct size classes (Fig. 311b)). It differs from *Pachycondyla* in having only a single comb-like spur on the hind leg (Fig. 307a) (the simple spur (Fig. 308aa) found in *Pachycondyla* is missing), and from *Ponera* in having the underside of the petiole uniformly convex and smooth (Fig. 316aa) (rather than with a small thin spot and a pair of small teeth (Fig. 315a)).

Biology

Hypoponera can be locally abundant and is readily found under rocks and other objects on the ground, in rotten wood and in leaf litter. They are cryptic predators, foraging in leaf litter, and some species are known to specialise on Collembola. The males of some species are wingless and worker-like (ergatoid).



Figs 629, 630.
Hypoponera worker from Mt Ainslie, ACT (head 0.82 mm wide).

Distribution and Habitats

This large genus contains 170 known species and subspecies and is found world wide. In Australia *Hypoponera* occurs along the Queensland coast, eastern New South Wales, throughout Victoria and Tasmania, south-eastern South Australia, southern Western Australia, the Kimberley region and the Top End of the Northern Territory (Fig. 631). They are most common in dry to wet sclerophyll and rainforests although they extend into drier forests in central New South Wales.

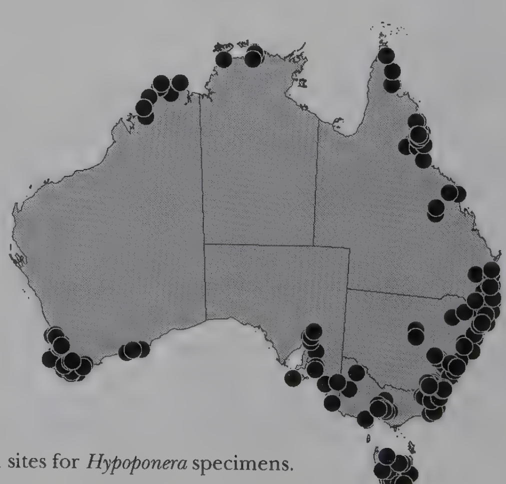


Fig. 631.
Collection sites for *Hypoponera* specimens.

List of Australian Species

convexiuscula (Forel)
decora (Clark)
elliptica (Forel)
herbertonensis (Forel)
mackayensis (Forel)
punctatissima (Roger) (= *mina* Wheeler)
queenslandensis (Forel)
rectidens (Clark)
scitula (Clark)
sulciceps (Clark)

LEPTOGENYS

Identification

The body is long and slender and ranges from 3.7 mm to 15.0 mm in total length (Fig. 633). The mandibles vary from long, thin and curved to broadly triangular, are inserted at the outer corners of the front margin of the head, and generally lack distinct teeth (except for a single tooth at the tip) (Fig. 632). The front margin of the clypeus is strongly angular and projects forwards between the base of the mandibles (Fig. 632). The tibiae of the hind legs each have both a large and comb-like (pectinate) and a small and simple spur at their tips (best viewed from the front) (Fig. 308aa). The claws on the hind legs usually have a series of small teeth on their inner surface (pectinate) (Fig. 317a), but sometimes have only a single tooth.

These distinctive ants can be recognised by their elongate heads often with thin, sickle-shaped mandibles (Fig. 632), the angular and projecting clypeus (Fig. 632) and the comb-like teeth on the tarsal claws (Fig. 317).

Biology

The nests of *Leptogenys* are found either in loose debris on the surface of the ground, or in soil. Nests on the ground surface are often used for only a short time before the colony moves to a new site, while nests in soil are occupied for longer periods. Workers are predacious and have a powerful sting. Foraging occurs throughout the day and night, with workers foraging either singly or in well-formed and distinct foraging trails. Some have well-developed cooperative foraging strategies, where numerous workers work together to capture and transport large prey. A few species specialise on isopods while others show a preference for termites. Some of the overseas species are like army ants in their foraging behaviour, but it is unknown if any of the Australian species share this trait. Most or all species have worker-like (ergatoid) queens. For notes on their taxonomy see Taylor (1988).

Figs 632, 633.
Leptogenys diminuta (Smith) worker from Mossman Gorge, 3 miles E of Mossman, Queensland (head 1.20 mm wide).

Distribution and Habitats

Leptogenys is a large genus with 236 known species and subspecies which are found throughout tropical regions of the world. The 25 species described from Australia are widespread in warmer areas, being absent from southern New South Wales and South Australia, Victoria and Tasmania, and south-eastern Western Australia (Fig. 634). They are found in a wide range of habitats from rainforests to the arid zone.

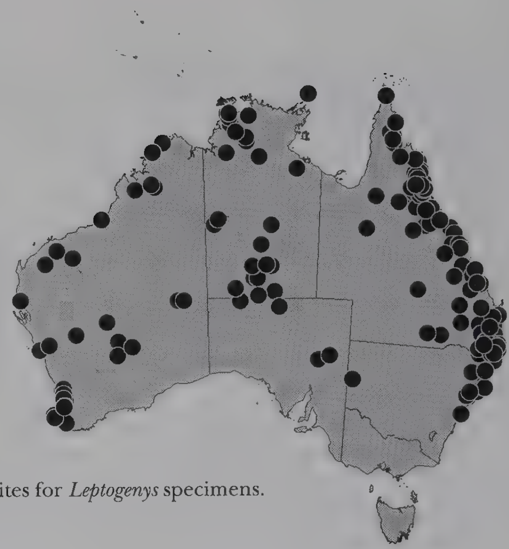


Fig. 634.
Collection sites for *Leptogenys* specimens.

List of Australian Species and Subspecies

adlerzi Forel
angustinoda Clark
anitae Forel
bidentata Forel
centralis Wheeler
chelifer (Santschi)
clarki Wheeler
conigera (Mayr) (= *conigera mutans* Forel)
darlingtoni Wheeler
diminuta (Smith) (= *diminuta yarrabahna* Forel)
ebenina Forel
excisa (Mayr) (= *excisa major* Forel)
exigua Crawley
fallax (Mayr)
fortior Forel
hackeri Clark
intricata Viehmeyer
longensis Forel
magna Forel
mjobergi Forel
neutralis Forel
podenzanai (Emery)
sjostedti Forel
tricosa Taylor (= *mjobergi* Forel)
turneri Forel

Myopias

Identification

With the head viewed from the front, the clypeus forms a central projection which extends well forward of the regions to either side, and the frontal lobes and antennal sockets are very near the front margin (Figs 322, 635). The mandibles are almost always long and slender (in one species they are expanded and nearly triangular) and there is always a gap between them and the front of the clypeus when they are closed (Figs 322cc, 635).

The narrowly projecting clypeus is unique to these ants, and most species also have unusually long and slender mandibles (Figs 322, 635). These characters will separate these ants from other ponerines found in Australia.

Biology

Myopias forms small colonies with fewer than 100 workers in rotten wood (in rainforests) or in soil under or between rocks (in sclerophyll woodlands). Workers are known to prey on a range of arthropods, including Collembola. They are infrequently collected and little is known of their biology. For additional details see Willey and Brown (1983).

Figs 635, 636.
Myopias densesticta Willey and Brown worker from near Kuranda, Queensland (head 1.04 mm wide).

Distribution and Habitats

The 35 known species and subspecies of *Myopias* are found from Sri Lanka east to South-east Asia and south through Indonesia and into the Solomon Islands and Australia. Within Australia they occur along the east coasts of Queensland and New South Wales, the ACT, southern Victoria and Tasmania, with two records from extreme south-west Western Australia (Fig. 637). They occur in rainforests in northern localities while they extend into dry sclerophyll woodlands in southern regions.

Fig. 637.
Collection sites for *Myopias* specimens.

List of Australian Species

chapmani Willey and Brown
delta Willey and Brown
densesticta Willey and Brown
tasmaniensis Wheeler (= *diadela* Clark)
tenuis (Emery)

MYOPOPONE

Identification

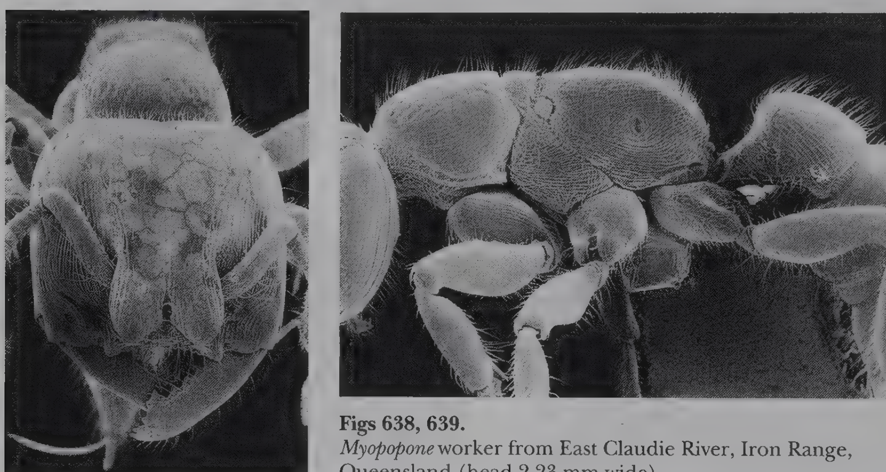
The mandibles are long and slender, with numerous (always more than five) teeth which vary greatly in size and are scattered along the inner margins, and with a sharp, pointed tooth at the tip which is only slightly longer than the next longest tooth (Figs 283, 638). The frontal lobes are large and extend well forward of the insertion point of the scapes, and when viewed from the front they cover the underlying clypeus and often form part of the front margin of the head (Figs 283a, 638). The antennae have the last few segments distinctly flattened in cross-section (Fig. 283b). The petiole has distinct front and upper faces but lacks a rear face,

and its attachment to the gaster is broad and approximately the same height as the petiole, so that the upper surfaces of petiole and gaster are separated by at most a shallow impression (Figs 279, 639).

Although these ants are superficially similar to some *Amblyopone*, the presence of expanded and projecting frontal lobes (Fig. 283a) and flattened tips of the antennae (Fig. 283b) will separate these ants from all others in Australia.

Biology

These rare ants nest in rotten wood or under bark, and single nests may be composed of several smaller nests scattered over a small area. They feed on large, soft-bodied insect larvae and may bring their larvae to food sources rather than attempt to move especially large prey back to the nest. For further details see Brown (1960).



Figs 638, 639.
Myopopone worker from East Claudie River, Iron Range, Queensland (head 2.23 mm wide).

Distribution and Habitats

Myopopone contains only a single species which extends from Sri Lanka east into Indonesia, New Guinea and Australia. Within Australia it is limited to rainforests of northern Cape York Peninsula, Queensland (Fig. 640).

List of Australian Species

castanea (Smith)

Fig. 640.
Collection sites for *Myopopone* specimens.

Mystrium

Identification

The mandibles are long and slender, with numerous (always more than five) teeth which are similar in size and scattered along the inner margins, and with the tips rounded and with very

short teeth (Figs 285, 641). The frontal lobes extend only slightly forward of the antennal sockets and do not cover the clypeus when viewed from the front (Figs 285, 641). The petiole has distinct front and upper faces but lacks a rear face, and its attachment to the gaster is broad and approximately the same height as the petiole, so that the upper surfaces of petiole and gaster are separated by at most a shallow impression (Fig. 279). The head and body have scattered hairs which are broad and rounded (spatulate) (Figs 285b, 641).

The long, thin mandibles with rounded tips and the spatulate hairs on the head and body, as well as the shape of the head (Figs 641, 642), are unique to these ants and will allow their ready identification.

Biology

These ants are rarely encountered and are poorly known. They are presumably predacious but this has yet to be confirmed. The Australian specimens have been found under rocks or dry logs on the ground and in leaf litter. They lie motionless when disturbed. For an overview of these ants see Brown (1952, 1960).


Figs 641, 642.
Mystrium camillae Emery worker from Kokoda, Northern District Papua New Guinea (head 1.03 mm wide).

Distribution and Habitats

Mystrium contains eight known species. They are found in Madagascar, the Cameroons, and South-east Asia east to the Philippines and south into northern Australia. Within Australia they have been collected four times in the Top End of the Northern Territory and a single time on Cape York Peninsula, Queensland (Fig. 643). They are limited to rainforests.

List of Australian Species

camillae Emery

Fig. 643.
Collection sites for *Mystrium* specimens.

Odontomachus

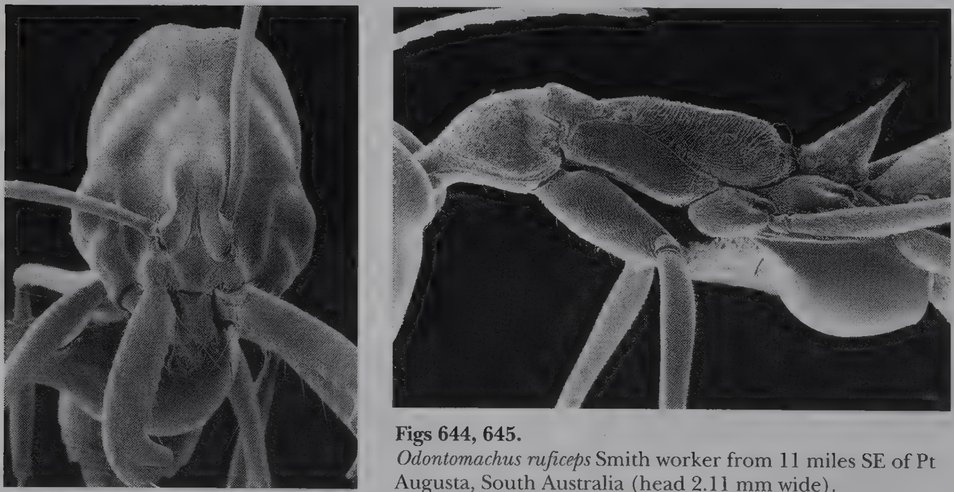
Identification

When viewed from the front, the outer surface of the head is complex, with narrow sections above and below bulging convexities which contain the eyes (Figs 291, 644). The mandibles are long and straight, inserted in the middle of the front margin of the head, and generally have only two or three large teeth near the tips (Figs 291a, 644) (although they sometimes have small teeth along the inner margins which are much smaller than the teeth at the tips). The top of the head has a pair of dark V-shaped lines (apophyseal lines) (Fig. 293a) which converge to form a distinct, sometimes shallow groove on the upper part of the front of the head (Fig. 293b).

These ants are immediately recognisable by the characteristic shape of the head and mandibles (Figs 291, 644). They are most likely to be confused with species of *Anochetus* but differ in being larger in overall length, in having the upper surface of the head with distinct dark lines (compare Fig. 293a with Fig. 294aa) and a central groove (compare Fig. 293b with Fig. 294bb), in having the gaster smooth and without a constriction between the first and second segments and in having the upper surface of the petiole with a single spine rather than being rounded or with a pair of small teeth.

Biology

Odontomachus workers are commonly encountered foraging on the surface of the ground both during the day and at night. They will also forage on low vegetation and on tree trunks. They are generalist predators on small invertebrates (Briese and Macauley 1981), hunting singly and capturing prey with their elongate trap-like jaws. Nests are primarily in soil, either in the open or under objects but they will also occasionally nest in rotten wood on the ground. For extensive notes on their biology and taxonomy see Brown (1976).



Figs 644, 645.
Odontomachus ruficeps Smith worker from 11 miles SE of Pt Augusta, South Australia (head 2.11 mm wide).

Distribution and Habitats

There are 60 described species and subspecies of *Odontomachus* with an additional two species known from fossil records. They occur in tropical and subtropical regions throughout the world. Within Australia *Odontomachus* is most common in northern regions from the arid zone into rainforests and is less common in southern regions (Fig. 646). It is rare or absent from eastern New South Wales, Victoria and extreme south-western Western Australia. There are two records from southern Tasmania but it is unlikely that the genus occurs there naturally.

List of Australian Species

- ***cephalotes*** Smith (= *ajax* Forel, *aruanus* Karavaiev, *cooktownensis* Forel, *cruenta* Emery, *fusca* Emery, *longitudinalis* Donisthorpe, *obtusa* Emery, *tamensis* Stitz, *ternatensis* Forel, *yorkensis* Stitz)
- ***ruficeps*** Smith (= *coriarius magnus* Mayr, *coriarius* Mayr, *coriarius obscurus* Crawley, *coriarius semicirularis* Mayr, *ruficeps actidens* Forel, *ruficeps rubriceps* Forel, *ruficeps rufescens* Forel, 1915, *septentrionalis* Crawley, *sharpie* Forel)
- ***turneri*** Forel

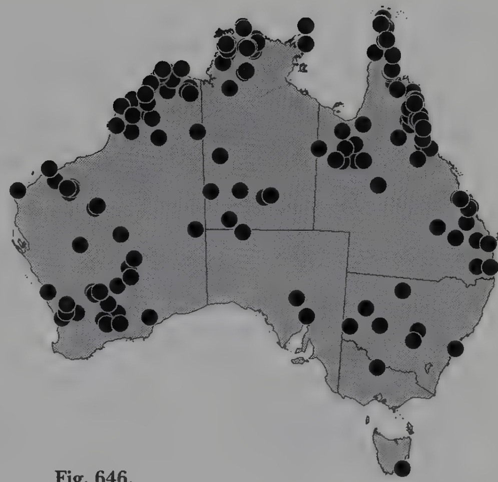


Fig. 646.
Collection sites for *Odontomachus* specimens.

ONYCHOMYRMEX

Identification

The mandibles are long and slender, with numerous (always more than three) teeth which vary greatly in size and are scattered along the inner margins, and with a sharp, pointed tooth at their tips which is at least four times longer than the next longest tooth (Figs 290, 647). The frontal lobes extend only slightly forward of the antennal sockets and do not cover the clypeus when viewed from the front (Figs 290, 647). The petiole has distinct front and upper faces but lacks a rear face, and its attachment to the gaster is broad and approximately the same height as the petiole, so that the upper surfaces of the petiole and gaster are separated by at most a shallow impression (Figs 479, 648). The tibiae of the hind legs usually lack spurs at their tips, but when present they are small, straight and not comb-like (pectinate) (best viewed from the front) (Fig. 288aa).

Onychomyrmex workers are most often confused with workers of *Amblyopone*. However, they differ in having the tooth at the tip of the mandible much longer (compare Fig. 290bb with Fig. 289b) and in lacking a comb-like spur on the hind tibia (compare Fig. 288aa with Fig. 287a).

Figs 647, 648.
Onychomyrmex worker from Lake Eacham, Queensland (head 0.74 mm wide).

Biology

These uncommon ants have an army-ant lifestyle. They alternate between temporary bivouacs in protected sites on the ground and semi-permanent nests in soil or in rotten logs. Groups of workers forage by forming distinct raiding columns across the surface of the ground. Some species are known to be specialist predators on centipedes. Queens have greatly extended gasters (they are dichthadiiform), and new colonies are formed by the division of established colonies. For additional details see Brown (1960) and Hölldobler and Wilson (1990).

Distribution and Habitats

Onychomyrmex is limited to Australia where it occurs in rainforests of coastal Queensland (Fig. 649). Although there are currently only three described species, many more are known and remain to be studied.

List of Australian Species

doddi Wheeler
hedleyi Emery
mjobergi Forel

Fig. 649.
Collection sites for *Onychomyrmex* specimens.

Pachycondyla

Identification

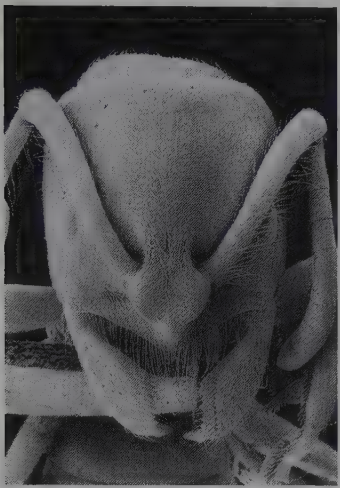
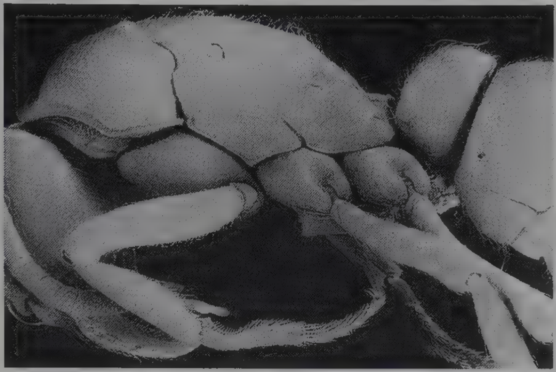
The mandibles are triangular, with numerous small teeth along their inner margins, and touch the front of the clypeus when closed (Figs 321, 650, 652, 654). The forward sections of the frontal lobes and antennal sockets are very close together and are separated by at most a very narrow rearward extension of the clypeus (Figs 298aa, 650, 652, 654) (sometimes the clypeus does not extend back between the frontal lobes and they are touching throughout their length). With the head viewed from the front, the clypeus extends across the entire width of the head in the form of a broadly rounded or angular plate, and the frontal lobes and antennal sockets are well behind the front margin (Figs 321, 650, 652, 654). The node of the petiole has distinct front, top and rear faces (Figs 320, 651, 653, 655). The tips of the tibiae of the hind legs each have two spurs, one large and comb-like (pectinate) and one small and simple (best viewed from the front) (Fig. 308aa).

Workers of *Pachycondyla* are most often confused with workers of *Cryptopone, Hypoponera* and *Ponera* because of the overall similarly shaped bodies. However, *Pachycondyla* differs from these in having both a large comb-like and a smaller simple spur on the hind leg (Fig. 308aa) (the others have only a single comb-like spur on the hind leg) (Fig. 307a).

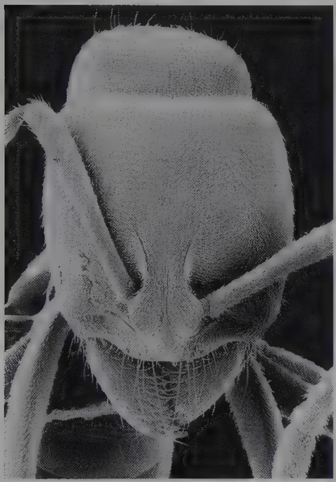
Biology

This is a large and diverse group of ants. They nest in soil either in the open or under rocks and logs, or occasionally in dense vegetation such as grass tussocks. While most are general predators or scavengers, some are specialist predators on termites. Some species will forage on the ground surface while others are limited to leaf litter or under objects on the ground. Some are also known to forage on trees at night. At least one of the species which specialises

on termites uses scouts to locate prey and then returns to their nest to recruit additional workers to the newly found food source (Hölldobler and Traniello 1980). Queens are absent in some species, being replaced by fertilised workers.

Figs 650, 651.
Pachycondyla sublaevis (Emery) worker from 5 km S of Aphis Creek, 44 km N of Marlborough, Queensland (head 3.30 mm wide).




Figs 652, 653.
Pachycondyla (subgenus *Brachyponera*) worker from about 18 km N of Coombah Homestead, New South Wales (head 1.10 mm wide).


Figs 654, 655.
Pachycondyla australis (Forel) worker from West Seymour Range, near Innisfail, Queensland (head 1.41 mm wide).

Distribution and Habitats

There are 277 known species and subspecies of *Pachycondyla* with an additional five species known from fossils. They are found world wide in the tropics and subtropics. Within Australia they are found in all areas except Tasmania (Fig. 656) and occur in a wide range of habitats.

Fig. 656.
Collection sites for *Pachycondyla* specimens.

List of Australian Species and Subspecies

astuta Smith
australis (Forel)
barbata Stitz
clarki (Wheeler)
croceicornis (Emery) (= *luteipes inops* Forel)
darwinii (Forel)
denticulata (Kirby)
dubitata (Forel)
excavata (Emery)
excavata acuticostata (Forel)
lutea (Mayr) (= *lutea clara* Crawley, *socialis* MacLeay)
mayri (Emery)
oculata (Smith)
pachynoda (Clark)
piliventris Smith
piliventris intermedia (Forel)
piliventris regularis Forel
porcata (Emery)
ruficornis (Clark)
rufonigra (Clark)
stigma (Fabricius)
sublaevis (Emery)
sublaevis kurandensis Forel
sublaevis murina Forel
sublaevis reticulata (Forel)
sublaevis rubicunda (Emery)

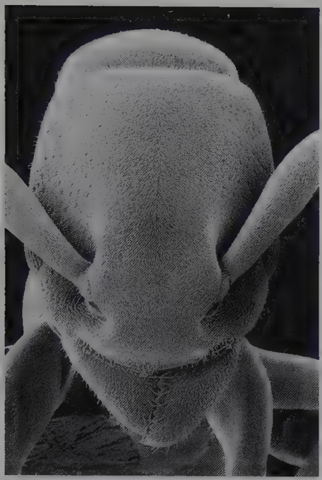
PLATYTHYREA

Identification

The forward sections of the frontal lobes and the antennal sockets are separated by the broadly rounded or triangular rearward extension of the clypeus (Figs 297a, 657). The node of the petiole has distinct front, top and rear faces (Figs 280aa, 658). The tips of the tibiae of the hind legs each have two comb-like (pectinate) spurs, one large and one small (Fig. 301a) (best viewed from the front, and note that the teeth on the small spur can be difficult to see when viewed from some angles). The combination of the broad rear section of the clypeus and the two comb-like spurs on the hind legs will separate these ants from others in Australia.

Biology

These uncommon ants nest in soil, in rotten wood or in hollow twigs on trees. Some are specialist predators on termites while others have a broader diet including a range of invertebrates. Some of the tropical species are known to run rapidly on logs or tree trunks when foraging. For additional details see Brown (1975).



Figs 657, 658.
Platythyrea worker from Pymbly, New South Wales (head 0.86 mm wide).

Distribution and Habitats

There are 37 known species of *Platythyrea*. One additional species is known from fossils. They occur in the tropics throughout the world. The five described Australian species are widespread in a range of habitats, although they are most abundant in moist, forested areas (Fig. 659).

Fig. 659.
Collection sites for *Platythyrea* specimens.

List of Australian Species

brunnipes (Clark)
dentinodis (Clark)
micans (Clark)
parallela (Smith) (= *cephalotes* Viehmeyer, *parva* Crawley, *pusilla australis* Forel)
turneri Forel (= *bicolor* Clark, *reticulata* Clark, *septentrionalis* Clark, *tasmaniensis* Forel)

PONERA

Identification

The mandibles are triangular and with numerous small teeth along their inner margins (Figs 314aa, 660). The forward sections of the frontal lobes and antennal sockets are very close together and are separated by at most a very narrow rearward extension of the clypeus (Figs 298aa, 660). The node of the petiole has distinct front, top and rear faces (Figs 315, 661). The underside of the petiole (subpetiolar process) has a translucent thin spot near the front and a sharp angle or a pair of small teeth near the rear (Fig. 315a). The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (best viewed from the front) (Fig. 307a).

Ponera belongs to a set of very similar genera which includes *Cryptopone*, *Hypoponera* and *Pachycondyla*. Because these genera have the same overall body shape they are often confused

with each other. *Ponera* is unique, however, in having the lower surface of the petiole elaborate, with a thin, circular spot near the front and a sharp angle or small pair of spines towards the rear (Fig. 315a).

Biology

Species of *Ponera* form small nests with fewer than 100 workers in protected places on the ground. The most common nesting sites are in the soil with or without coverings, in cracks or between rocks, in rotten wood, or under bark or moss on rotten logs. They forage cryptically in leaf litter on the ground and are often collected by using Berlese funnels. Their biology and taxonomy have been discussed by Taylor (1967).

Figs 660, 661.
Ponera worker from Iron Range, Queensland (head 0.40 mm wide).

Distribution and Habitats

World wide, the 32 species of *Ponera* are known from North America, and Europe east to Japan, Samoa and Australia. An additional four species are known from fossil records. Four species are currently known from Australia, only one of which is limited to Australia, the others also occurring in Papua New Guinea. The northern Australian records of *Ponera* are from rainforests, while the southern collections range from rainforest to dry sclerophyll woodlands and ocean beaches. The majority of *Ponera* specimens have been encountered along the east coast, although several collections have been made outside this area (Fig. 662). These include northern Northern Territory, northern Western Australia and south-eastern South Australia.

Fig. 662.
Collection sites for *Ponera* specimens.

List of Australian Species

clavicornis Emery
leae Forel (= *exedra* Wilson, *leae oculata* Wheeler, *leae norfolkensis* Wheeler)
selenophora Emery
tenuis (Emery)

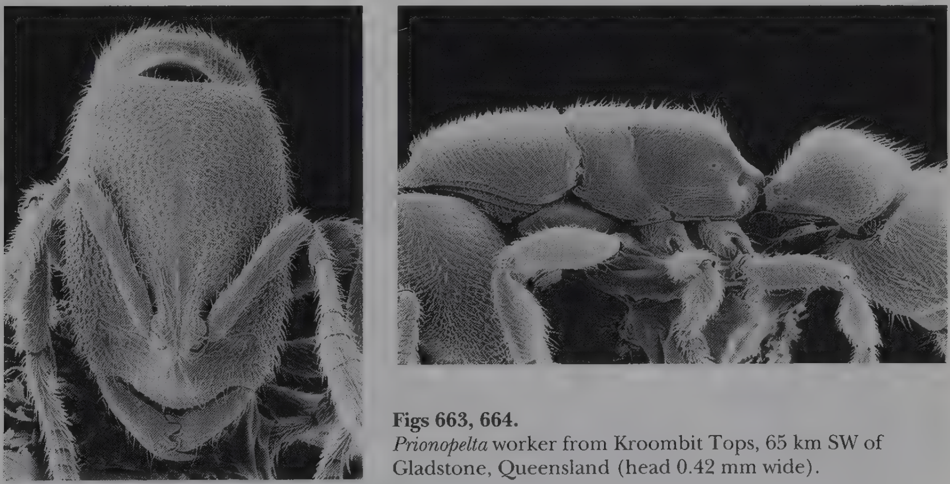
PRIONOPELTA

Identification

The mandibles are long and slender and usually have three teeth (although sometimes with a few very small denticles as well) that are grouped together near the tip on a face separate from the rest of the mandible (Figs 281a, 663). The petiole has distinct front and upper faces but lacks a rear face, and its attachment to the gaster is broad and approximately the same height as the petiole so that the upper surfaces of petiole and gaster are separated by at most a shallow impression (Figs 279, 664). The overall length is small, less than about 2 mm. These small ants can be recognised by the shape of the mandibles and petiole. These characters will separate them from other Australian ants.

Biology

Prionopelta is uncommonly encountered. The genus nests in soil under objects, under bark or in rotten wood. Workers are rarely seen above ground and they apparently forage primarily in leaf litter or in other cryptic situations. Brown (1960) provides additional details on the biology and taxonomy of these ants.



Figs 663, 664.
Prionopelta worker from Kroombit Tops, 65 km SW of Gladstone, Queensland (head 0.42 mm wide).

Distribution and Habitats

Prionopelta contains 13 known species and is found world wide in tropical regions. The single species known from Australia is most common in wet sclerophyll and rainforests along the east coasts of Queensland and northern New South Wales, is rare in the Top End of the Northern Territory and has been collected once in the Grampians of Victoria (Fig. 665).

List of Australian Species

kraepelini Forel

Fig. 665.
Collection sites for *Prionopelta* specimens.

PROBOLOMYRMEX

Identification

The frontal lobes are reduced to a narrow, sharp ridge between the antennal sockets, and the insertion points of the antennae are clearly visible when viewed from the front (Figs 295a, 666). The eyes are absent (Fig. 295b). These small, slender ants are one of the few ponerines that lack eyes. This lack of eyes, combined with the exposed antennal insertion points, will allow identification of these ants.

Biology

This is one of the rarest ants in Australia, having been collected fewer than ten times. They are cryptic foragers in leaf litter and presumably also forage below the ground surface. Nests are in soil under rocks, in leaf litter or in rotten wood. Their taxonomy and biology have been examined by Taylor (1965b) with additional notes by Brown (1975).

Figs 666, 667.
Probolomyrmex greavesi Taylor worker from West Claudie River, Iron Range, Queensland (head 0.40 mm wide).

Distribution and Habitats

There are 13 known species of *Probolomyrmex,* which occur in tropical regions throughout the world. Within Australia they have been found on Cape York Peninsula and extreme south-eastern Queensland, and in the ACT (Fig. 668). Northern collections have been made in rainforests, while the southern localities have been in a sclerophyll woodland and a pine plantation.

List of Australian Species

greavesi Taylor

Fig. 668.
Collection sites for *Probolomyrmex* specimens.

PROCERATIUM

Identification

The upper plate (tergite) of the second segment of the gaster is strongly arched so that it forms the rear-most part of the gaster when viewed from the side, and the remaining segments are pushed forward so that the sting is pointing towards the front (Fig. 275). The mandibles have three or more teeth (Figs 278aa, 669). The clypeus does not extend forward and the rear sections of the mandibles are visible when they are closed (Figs 278bb, 669). The antennae are 12-segmented (including the scape) and the last (apical) segment is moderately enlarged but distinctly shorter than the remaining segments combined (excluding the scape) (Fig. 278cc).

Proceratium can be separated from all other ants in Australia, with the exception of *Discothyrea*, by the highly curved shape of the gaster (Fig. 275). They can be distinguished from the superficially similar *Discothyrea* by differences in the number of antennal segments, the number of teeth on the mandibles and the shorter, less projecting leading edge of the clypeus (compare Fig. 278 with Fig. 277).

Biology

These cryptic ants forage in leaf litter. They are thought to be specialised predators of arthropod eggs. Their nests are small, often with fewer than 100 workers, and are found in soil or rotten wood. They are seldom encountered. For further information see Brown (1958c, 1974, 1980).

Figs 669, 670.
Proceratium worker from Boar Pocket, Queensland (head 0.61 mm wide).

Distribution and Habitats

Proceratium contains 29 known species and is found world wide, with one additional species known from fossil records. Within Australia, the two known species are found in the Top End of the Northern Territory and along the east coast of Queensland and north-east New South Wales (Fig. 671). They are limited to rainforests.

List of Australian Species

papuanum Emery
stictum Brown

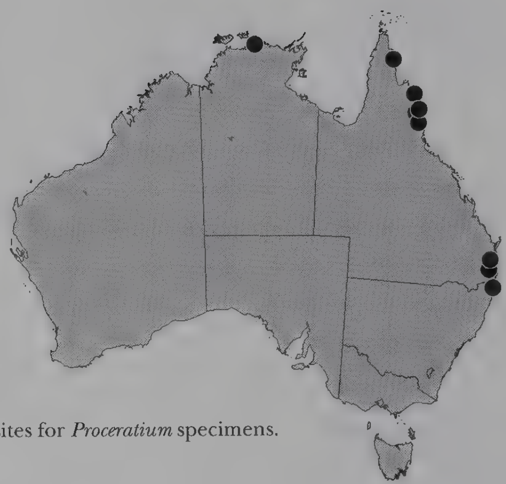


Fig. 671.
Collection sites for *Proceratium* specimens.

RHYTIDOPONERA

Identification

The forward sections of the frontal lobes and the antennal sockets are separated by the broadly rounded or triangular rearward extension of the clypeus (Figs 297a, 672, 674). The leading edge of the pronotum on each side just above the front legs has a small angular tooth or spine (Figs 300, 673, 675). The node of the petiole has distinct front, top and rear faces (Figs 300, 673, 675). The tips of the tibiae of the hind legs each have either a single small, simple (Fig. 302aa) or comb-like (pectinate) (Fig. 303bb) spur, or two spurs, one large and comb-like (pectinate) and one small and simple (Fig. 304cc) (best viewed from the front). The claws on the hind legs have a tooth at about the middle of their inner surface (Fig. 305a).

Rhytidoponera is most similar to *Heteroponera* in overall body shape and size. However, the claws in *Rhytidoponera* have a small tooth along their inner margins (Fig. 305a) while in *Heteroponera* the claws are simple (Fig. 306aa).

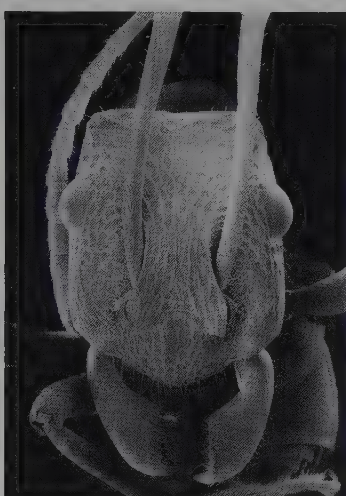
Biology

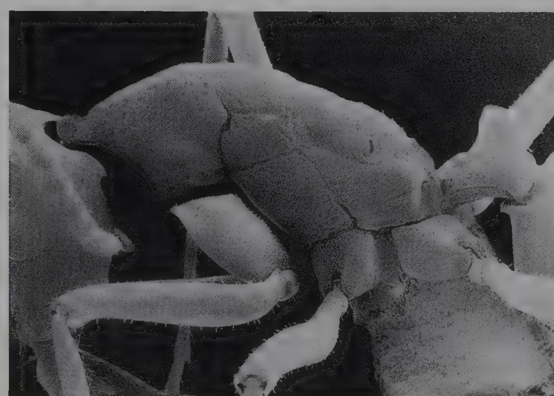
These are some of the most common ants in Australia. They are found throughout the continent and can be very abundant, especially in urban areas such as yards, gardens and parks. Some species, especially those found in forested areas, generally forage during the day, while many of the arid zone species forage primarily in the evening and at night. In forested areas they will forage on low vegetation and trees as well as on the ground. They are general predators or scavengers (Briese and Macauley 1981), with some also taking honeydew and others showing a strong preference for seeds (Clayton-Greene and Ashton 1990). Workers generally forage singly or less often in small groups. Some of the smaller species have a potent sting while others, including the larger species, have a weak sting or are unable to sting.

Nests are generally in soil either in the open or under rocks or other objects on the ground. When in the open, nests range from low and messy mounds to large mounds decorated with stones and small twigs or leaves. Species found in wet sclerophyll and rainforests often nest in rotten wood. Some northern rainforest species will occasionally nest arboreally (although they nest in the ground as well).

Most species lack queens and instead have fertilised workers which produce brood. In some, where true queens are present, the queens may be replaced by fertilised workers when they die. For additional details about these diverse ants see Brown (1954, 1958b), Clark (1936), Crosland (1990), Hughes and Westoby (1992a, 1992b), and Ward (1980, 1983a, 1983b, 1986).

Figs 672, 673.
Rhytidoponera metallica (Smith) worker from about 8 km SW of Mt Garnet, Queensland (head 1.48 mm wide).





Figs 674, 675.
Rhytidoponera worker from Hay, New South Wales (head 2.41 mm wide).

Distribution and Habitats

Rhytidoponera is a large genus with 104 described species, 76 of which occur in Australia, and with a single species known from a fossil. They are limited to eastern Indonesia, New Guinea, the Solomon Islands, New Caledonia and Australia. Within Australia they occur in all habitats from the arid zone to rainforests, and are common in both undisturbed and disturbed sites (Fig. 676).

Fig. 676.
Distribution of *Rhytidoponera*.

List of Australian Species

aciculata (Smith) (= *cristatum caro* Forel)
anceps Emery
araneoides (Le Guillou) (= *araneoides arcuata* Stitz)
aspera Roger (= *arnoldi* Forel)
aurata (Roger) (= *flava* Crawley)
barnardi Clark
barretti Clark
borealis Crawley (= *brunnea* Clark)
carinata Clark
cerastes Crawley
chalybaea Emery (= *cyrus* Forel)
chnoopyx Brown
clarki Donisthorpe (= *hilli* Clark, *metallicum obscurum* Forel)
confusa Ward
convexa (Mayr) = *nigra* Clark)
cornuta (Emery)
crassinoda (Forel)
cristata (Mayr)
croesus Emery (= *victoriae andrei* Wheeler and Chapman, *fastuosa* Santschi)
dubia Crawley
enigmatica Ward
eremita Clark
ferruginea Clark
flavicornis Clark
flavipes (Clark)
flindersi Clark
foreli Crawley
foveolata Crawley
fuliginosa Clark
greavesi Clark
gregoryi Clark
haeckeli (Forel)
hilli Crawley
impressa (Mayr)
incisa Crawley
inornata Crawley (= *metallica carbonaria* Wheeler)
kurandensis Brown
lamellinodis Santschi
laticeps Forel
levior Crawley (= *douglasi* Brown)
maledicta Forel
maniae (Forel) (= *convexum spatiatum* Forel)
mayri (Emery) (= *dixoni* Clark, *mayri glabrius* Forel, *occidentalis* Clark, *petiolata* Clark, *quadriceps* Clark, *stridulator* Clark)
metallica (Smith) (= *caeciliae* Viehmeyer, *metallica purpurascens* Wheeler, *metallica varians* Crawley, *pulchra* Clark)
micans Clark
mirabilis Clark
nitida Clark
nodifera (Emery) (= *pronotalis* Crawley, *rothneyi* Forel, *rothneyi mediana* Viehmeyer)
nudata (Mayr)
peninsularis Brown
pilosula Clark
punctata (Smith)
punctigera Crawley
punctiventris (Forel)
purpurea (Emery) (= *impressum splendidum* Forel)
reflexa Clark
reticulata (Forel)
rufescens (Forel)
rufithorax Clark
rufiventris Forel (= *castanea* Crawley)
rufonigra Clark
scaberrima (Emery) (= *laciniosa malandensis* Forel)
scabra (Mayr)
scabrior Crawley
socra (Forel)
spoliata (Emery)
tasmaniensis Emery (= *metallicum cristulatum* Forel)
taurus (Forel) (= *cerastes brevior* Crawley, *cornuta fusciventris* Stitz)
tenuis (Forel)
trachypyx Brown
turneri (Forel)
tyloxys Brown and Douglas
victoriae (André) (= *metallicum modestum* Emery, *victoriae cedarensis* Forel)
violacea (Forel) (= *convexum gemma* Forel, *convexa opacior* Clark)
viridis (Clark)
yorkensis Forel

Unnamed Genus #3

Identification

The eyes are absent (Figs 313b, 677) although in some individuals there are small dimples or slight discolorations where the eyes would be expected. The mandibles are thin and have three or four widely spaced teeth (Figs 313a, 677). The forward sections of the frontal lobes and antennal sockets are very close together and are separated by at most a very narrow rearward extension of the clypeus (Figs 313, 677). The node of the petiole has distinct front, top and rear faces (Figs 280aa, 678). The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (Fig. 307a) (best viewed from the front). These ants can be separated from other Australian ponerines by the very reduced or absent eyes and the shape of the mandibles.

Biology

This genus is rarely encountered and is known from only four collections. Workers or nests have been found under rocks or under bark. All collections have been small, consisting of only a few workers.

Figs 677, 678.
Unnamed Genus #3 worker from Pioneer, Tasmania (head 0.48 mm wide).

Distribution and Habitats

These ants are limited to wet sclerophyll and temperate rainforests on the south coast of New South Wales, southern Victoria and northern Tasmania (Fig. 679).

List of Australian Species

The only known species in this genus is currently undescribed.

Fig. 679.
Collection sites for Unnamed Genus #3 specimens.

Identification

The mesosoma is attached to the gaster by two distinct segments, the petiole and postpetiole (Fig. 681). The mandibles are triangular and relatively short (Fig. 680). The eyes are large and elongate (Figs 40d, 680). The pronotum and mesonotum form separate plates which are connected by a flexible joint (Figs 40a, 681).

These distinctive ants are recognisable by their elongate, black bodies, large eyes and short antennae. They are most often confused with species in the subfamily Myrmicinae, but differ in that the pronotum and mesonotum form separate plates rather than being fused as in the myrmicines.

Overview

The subfamily Pseudomyrmecinae is represented in Australia by a single genus, *Tetraponera.* Their elongate, slender bodies and large, oval eyes, combined with their arboreal habits, are distinctive and make these ants easily recognisable.

This subfamily contains three genera and they are found world wide primarily in tropical and subtropical areas, although they extend south into more temperate areas in Australia. There are over 250 described species and subspecies in the subfamily, five of which are known from Australia.

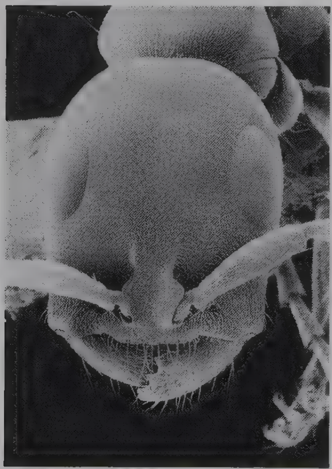
Tetraponera

Identification

These ants are easily recognisable by their elongate, slender bodies (Fig. 681), large, oval eyes (Fig. 680) and black colouration. They are most similar to species in the subfamily Myrmicinae, but the flexible joint between the pronotum and mesonotum (Figs 40a, 681), and the toothed claws on the tarsi, will differentiate them.

Biology

These ants are highly arboreal, nesting in hollow twigs or branches of trees or shrubs. They are almost always found on vegetation although they will occasionally forage on the ground around the bases of trees or shrubs. Workers have acute vision and will dart to the far side of twigs or branches when approached.



Figs 680, 681.
Tetraponera punctulata Smith worker from 10 km SW of Giru, Queensland (head 1.08 mm wide).

Distribution and Habitats

There are 122 known species and subspecies of *Tetraponera* found from Africa east in tropical regions to New Guinea and Australia. An additional 6 species are known from fossil records. Within Australia, five species and subspecies are found in a range of forested habitats in warmer areas, extending south to central New South Wales, southern Northern Territory and southern Western Australia (excluding the extreme southern coastal region) (Fig. 682). They have also been found twice in the Flinders Ranges of South Australia.

List of Australian Species and Subspecies

allaborans (Walker)
laeviceps (Smith)
nitida (Smith)
punctulata Smith
punctulata kimberleyensis (Forel)

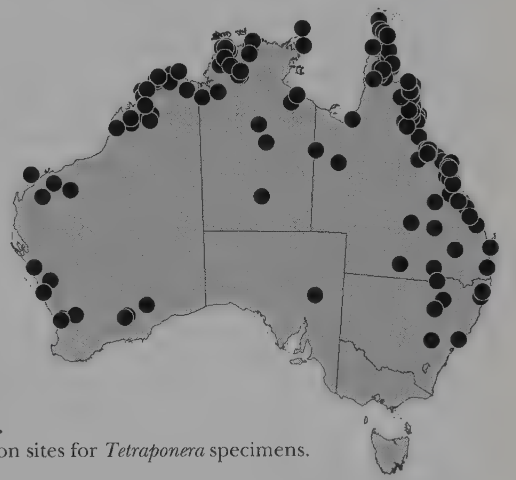


Fig. 682.
Collection sites for *Tetraponera* specimens.

GLOSSARY

acidopore (Fig. 14) – A small circular opening or orifice at the tip of the gaster used to expel formic acid as part of the defensive and communication system. When present the acidopore is generally surrounded by a fringe of short hairs or setae and is easily seen. In a few species the fringe of hairs is lacking and the acidopore can be difficult to detect. This structure is found only in the subfamily Formicinae and occurs in all genera within this subfamily.

antennae (singular antenna) (Figs 11, 12) – The primary sense organs located on the front of the head. The first segment (the one closest to the head) is called the scape and is always much longer than the remaining segments in workers and queens; in males the scape is generally shorter than in workers but may be long in some groups. The antenna in ants is always elbowed. That is, the connection between the scape and the remaining segments (collectively called the funiculus) is angular, so much so that the scape and funiculus can fold onto each other and touch for their entire length when at rest. The number of segments in the antennae of workers ranges from 4 to 12, with 12 being the most common. When counting the number of segments, the scape as well as the funicular segments are included.

antennal socket (Fig. 11) – The socket on the front of the head just above the clypeus where the antenna attaches to the head. The antennal socket is a small pocket into which the ball-like end of the antennal scape inserts. This socket can be completely visible when the head is viewed from the front, or may be partially or completely hidden by the frontal lobes.

antennal scrobes (Figs 11, 12) – Elongate impressions, grooves or troughs on the front of the head which receive the antennae when at rest. These are always found in pairs, one for each antenna. Scrobes vary greatly in their development from shallow depressions in the surface of the head to deep trenches which extend into the head itself and completely hide the antennae when at rest.

claws (Figs 12, 14) – Small, curved claws which occur in pairs at the tips of the tarsi (technically on the pretarsus, the segment found at the tip of the tarsus, and thus their true name is pretarsal claws). The claws are most commonly simple, that is with a single curved shaft terminating in a sharp point. However, in some groups the claws can have from one to many small teeth along their inner margins.

clypeus (Figs 11, 12, 14) – The plate on the lower front of the head above the mandibles and below the antennae. Its lower edge (above the mandibles, here called the front margin) is usually convex in overall shape, but can be highly modified with concave regions, teeth or variously shaped projections. The central rear section of the clypeus (near the antennae) is usually narrowed, convex or triangular and often extends between the forward sections of the frontal lobes. The central region of the clypeus is usually smooth and gently convex across its entire width, although in some groups it may have a pair of weak to well-developed diverging ridges (in which case the clypeus is described as being longitudinally bicarinate).

coxa (plural coxae) (Figs 12, 14) – The segment of the leg nearest the body. The other segments of the leg include the very short trochanter, the long femur, the tibia and the tarsus (which is composed of five segments with a pair of claws at its tip).

dimorphic (Figs 4–7) – Referring to a worker caste in which major and minor workers are present, but not intermediate forms. 'Majors' and 'minors' often differ notably in the relative sizes of their heads. In extreme cases majors and minors can differ primarily in shape, with similarly sized bodies but having heads which differ in size by a factor of two to three. Compare with monomorphic and polymorphic.

eye (or compound eye) (Figs 11–14) – When present, the eyes are located on the front or sides of the head and are composed of between one and several thousand individual facets or ommatidia. The eyes are absent in a few species. See also ommatidia and compare with ocelli.

femur (plural femora) (Figs 12, 14) – The third (counting from the body) and usually longest segment of the leg. The first segment of the leg is the coxa, the second is the very short trochanter, the third is the femur, the fourth is the tibia and the last is the tarsus (which is composed of five segments with a pair of claws at its tip).

frontal carinae (singular frontal carina) (Fig. 11) – A pair of ridges on the front of the head which start just above the clypeus and inside the antennal sockets and extend upwards. Their development varies from being very short, weakly developed or even absent to very distinct and running to the upper margin of the head. The lower section of the frontal carinae are often expanded towards the sides of the head and partially or completely cover the antennal sockets. In these cases this section of the frontal carinae are termed the frontal lobes.

frontal lobes (Fig. 11) – The lower sections of the frontal carinae when the carinae are expanded towards the sides of the head as lobes. The frontal lobes often partially or completely cover the antennal sockets.

funiculus (Figs 11, 12, 14) – The segments of the antenna beyond the first, elongated segment (the scape) and composed of between 3 and 11 segments (in workers). Individual segments of the funiculus are generally very short when compared with the scape and are often nearly square (that is, as broad as long). The funiculus is connected to the scape by a highly flexible joint which allows the scape and funiculus to fold onto each other and touch along their entire length when at rest.

gaster (Figs 12, 14) – The rearmost section of the body, behind the petiole (when the postpetiole is absent) or the postpetiole (when present). This is often the largest segment of the body and possesses the sting (when present). It is generally round in cross-section and oval or elongate in side view.

gastral – Referring to or of the gaster. For example, the first gastral segment is the first segment of the gaster.

head (Figs 11, 12, 14) – The first section of the body. The head contains the eyes, antennae and mandibles (among other structures).

labial palps (Fig. 13) – A pair of short, antennae-like sensory organs found on the labium. The labium is the central, elongate part of the mouthparts visible on the underside of the head. The labial palps contain between one and four segments, with four being the most common number. See also maxillary palps and palp formula.

mandibles (Figs 11–14) – The most obvious structures of the mouthparts, located on the lower front of the head. The mandibles vary greatly in size and shape, ranging from short to elongate and from straight to triangular. Most have teeth along their inner margins, ranging from a single tooth at the tip to 20 or more along their entire length.

maxillary palps (Fig. 13) – A pair of short, antennae-like sensory organs found on the maxilla. The maxillae are a pair of elongate structures found on each side of the labium and are visible on the underside of the head. The maxillary palps contain between one and six segments, with six being the most common number. See also labial palps and palp formula.

mesonotum (Figs 12, 14) – The upper surface of the mesosoma behind the pronotum and before the metanotal groove. This is essentially the central third of the mesosoma. The

mesonotum can be fused with the pronotum to form a single plate or surface, in which case its exact delimitation is difficult to determine.

mesosoma (Figs 12, 14) – The second and middle section of the body behind the head and in front of the petiole, and to which the legs are attached. The mesosoma has numerous structures of taxonomic importance, including the mesonotum, mesosternum, metanotal groove, metapleural gland, pronotum, prosternum, propodeum and propodeal spiracle. The mesosoma is also called the alitrunk.

metanotal groove (Figs 12, 14) – A groove, angle or depression on the upper surface of the mesosoma which separates the mesonotum and the propodeum. In some groups the metanotal groove is reduced to a simple line or suture and the upper surface of the mesosoma is uniformly arched when viewed from the side. The metanotal groove represents the upper section of the metathorax, the third segment of the insect thorax, which is highly modified and generally absent in ants.

metapleural gland (Fig. 14) – A gland and corresponding opening located on the side of the mesosoma immediately above the coxa of the hind leg and below the propodeal spiracle, near the insertion of the petiole. Its small opening is often surrounded by small ridges or is located in a shallow, elongate depression. The opening is also often protected by a fringe of elongate hairs or setae. In a few groups the metapleural gland is absent and the area above the hind leg lacks an opening.

monomorphic – Used to describe a worker caste where all workers are approximately the same size and/or shape. Compare with monomorphic and polymorphic.

node (of petiole and postpetiole) (Figs 12, 14) – The arched projections on the upper surfaces of the petiole and postpetiole. These structures vary greatly in size and shape. Most commonly they are broadly to narrowly rounded above and are about as high as the petiole or postpetiole is long. They can also be low and essentially absent, with the petiole or postpetiole being tube-like or barrel shaped. In other cases they are armed with spines or teeth, or are expanded towards the sides of the body.

ocelli (singular ocellus) (Fig. 11) – Simple eyes, composed of single bead-like facets or lenses, located on the upper surface of the head near the rear margin. Ocelli are usually found in a triangular grouping of three.

ommatidia (singular ommatidium) – Individual elements or facets of the compound eye.

palp formula – A standardised method for indicating the number of maxillary and labial palp segments. For example, a palp formula of 6:4 indicates that the maxillary palps have six segments while the labial palps have four segments.

palps (Fig. 13) – The small, segmented sensory organs found on the maxilla and labium (parts of the mouthparts, visible on the underside of the head immediately behind the mandibles).

pectinate – Comb-like. Used to describe the tibial spurs (among other structures).

peduncle – The narrow forward section of the petiole in front of the node. This section can be long, short or absent. When the peduncle is absent, the node of the petiole is essentially the same length as the entire petiole.

petiole (Figs 12, 14) – The segment of the body behind the mesosoma and in front of the postpetiole (when present) or the gaster (when the postpetiole is absent). The upper surface of the petiole is often high and rounded or angular. This upright structure is called the node. In some cases the node is absent and the petiole is low and tube-like. See also peduncle.

polymorphic – Refers to a worker caste which shows a large, continuous range in size from small to large workers. In general majors differ from minors in overall body length as well as in having relatively larger heads. Compare with monomorphic and polymorphic.

postpetiole (Fig. 12) – The segment of the body behind the petiole and in front of the gaster. The upper surface of the postpetiole is often high and rounded or angular. This upright structure is called the node. In some cases the node is absent and the postpetiole is low and rounded. The postpetiole is absent in some groups.

pronotum (Figs 12, 14) – The upper surface (tergite) of the first segment of the mesosoma, immediately above the front legs. In most ants it forms a separate, distinct plate but in some it is fused with the mesonotum to form a single plate.

propodeum (Figs 12, 14) – The rear section of the mesosoma, above the hind leg and immediately before the petiole.

psammophore (Fig. 14) – A set of elongate hairs or setae on the underside of the head. These hairs often form a basket-like structure which is used for carrying soil during nest excavation.

pygidium (Fig. 12) – The upper surface (tergite) of the last segment of the gaster. This is generally the smallest plate of the gaster and is located nearest the tip.

scape (Figs 11, 12, 14) – The first segment of the antennae nearest the head. In workers, this is the longest antennal segment and is often only slightly shorter than the remaining segments combined (the funiculus).

scrobe – See antennal scrobes.

seta (plural setae) – An elongate hair. They can be appressed against the surface of the body or erect and standing upright above the surface.

spiracle (Fig. 14) – A small opening in the body which is part of the respiratory system. The most obvious spiracles are generally those near or in the metanotal groove and on the sides of the propodeum. The shape and location of the propodeal spiracle can be of significant taxonomic importance.

sternite – The lower plate of a segment. The upper plate is termed the tergite.

sting (Fig. 12) – A defensive structure at the tip of the gaster. The sting is found in all Australian ants except those in the subfamilies Dolichoderinae and Formicinae. It can be retracted into the body and may not be visible in some individuals.

subpetiolar process (Fig. 12) – A projection or lobe on the underside of the petiole near its attachment to the propodeum. This process varies from being absent to long and thin to broad and rounded.

suture – The line, seam or impression formed where two plates or sclerites meet.

tarsus (plural tarsi) (Figs 12, 14) – The last (counting from the body) segment of the leg nearest the tip and attached to the tibia. It is composed of five segments and is armed with a pair of claws at its tip.

tergite – The upper plate of a segment. The lower plate is termed the sternite.

tibia (plural tibiae) (Figs 12, 14) – The fourth (counting from the body) and usually the second longest segment of the leg. The first segment of the leg is the coxa, the second is the very short trochanter, the third is the very long femur, the fourth is the tibia and the last is the tarsus (which is composed of five segments with a pair of claws at its tip).

tibial spur (Figs 12, 14) – A large, stout, articulated hair-like or spine-like structure located at the tip of the tibia near the tarsus. The number of spurs can be none, one or two, and they can be simple or comb-like (pectinate). These structures are best viewed from the front with the leg extending outwards from the body at right angles to its long axis.

trochanter (Figs 12, 14) – The second (counting from the body) segment of the leg. This very short segment is found between the coxa and femur.

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Australian Ants: Their Biology and Identification

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Detailed information is presented on all 103 ant genera known to occur in Australia and this book contains:

- information on the general biology of ants;
- their distribution patterns within Australia;
- an overview of life cycles and nesting habits;
- notes on feeding habits and pest status;
- illustrated keys to identify all 103 Australian ant genera;
- scanning electron micrographs for all but two of the genera; and
- a glossary and important references.

Australian Ants is designed for both the specialist and the enthusiast, and uses minimal technical language and extensive illustrations. This book will be a valuable reference for anyone interested in these fascinating animals.

Australian Ants: *Their Biology and Identification is a breakthrough book in the subject, an important contribution both to science and popular natural history. It serves not only as an update of classification and distribution of Australian ants to the generic level, but a field guide that will open the fauna to both professional biologists and naturalists.*

EO Wilson
Museum of Comparative Zoology
Harvard University

Shattuck has produced a comprehensive guide to the ant genera of Australia that is both easy to read and well illustrated. Its coverage of the entire fauna makes it a must for anyone interested in the identification and distribution of ants in the continent.

Barry Bolton
The Natural History Museum, London

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